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JOURNAL OF EDUCATIONAL RESEARCH

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JOURNAL *of* EDUCATIONAL RESEARCH

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MEASUREMENT AND EXPERIMENTATION AND EDUCATION FOR INDEPENDENT RECONSTRUCTION[1]

PEDRO T. ORATA
Ohio State University

I. A TYPICAL SCHOOL SITUATION AND THE PROBLEM

THE principal of a city high school called his teachers together at the beginning of the year to discuss the problem of improving the achievement of the pupils in the various school subjects. He pointed out at the outset that the school ranked below the average in the state tests the year before, and the problem as he saw it was "to do something about it by raising standards in the various classes." No sooner had he made his point than one of the younger members of the staff raised the question of the validity and accuracy of the state tests in measuring the work of the school. He pointed out that the objectives of the school were not measured by the tests. For instance, he claimed, "the tests were purely factual and informational in nature, required automatic and standardized answers, and did not deal with practical problems of individual and group living at all."

[1] The reader should be forewarned that this paper deals with *one* view of measurement and experimentation in education, namely, as the title indicates, from the point of view of *independent reconstruction of experience*. Such a view if applied to schools below high school must meet the objection that the minds of the pupils are physically in the process of growth and lack both in knowledge of social meanings and in certainty of judgment.

The term *reconstruction of experience* means any significant change in or reorganization of experience in terms of new meanings or insights, habits, interests, attitudes, ideals or standards, "which adds to the meaning of experience and which increases the ability to direct the course of subsequent experience." Reconstruction is *independent* if the individual pupil himself is allowed to do his own thinking without the school determining the nature and direction of the outcome. The work of the school is to be measured by the extent to which it (1) reveals the need for reconstruction by making the individual increasingly aware of the conflicts and discrepancies in his beliefs, attitudes, ideals, and practices; (2) provides basic and adequate background of information and skills or techniques of procedure that are necessary in effecting reconstruction; and (3) enables the individual to evaluate adequately the outcome of his thinking or performance in terms of his expanding life program and in relation to the interests and welfare of society as a whole. Several illustrations are given towards the end of this paper, especially under the topic of *The Unity of the Educative Process.*

He then went on to show by illustrations from the test items that his contention was valid, and that while the school stood for the development of appreciation in literature, for stimulating reflective thinking in the science, mathematics, history, and economics classes, and for other more or less general traits, the tests did not show whether or not and to what extent the pupils really acquired these desirable traits which the school was supposed to promote in them. Instead, the tests emphasized the mere recall of facts, dates and events in history, formal solution of problems in geometry, recalling recipes and giving the meanings of technical terms in home economics, and the like. He concluded that if the standards are to be improved for teaching the pupils more effectively to be able to do the things that make for successful living, the tests should be improved so that they will measure results in accordance with the objectives that the school had decided should be achieved through the medium of the school subjects.

Whereupon one of the more mature teachers pointed out that it "is hardly necessary to insist that unless the pupils have the necessary facts and information to think with, they will never be able to think. One cannot think in a vacuum. The school cannot and must not tell what the pupils should think; all it can and should do is to furnish them with a background with which to think." This background, he further states, "consists of knowledges, habits, techniques, and the like," and, he concluded, "is it not plainly evident that the state tests deal with just these tools of thinking, appreciation, social insight, and all the rest?" His stand therefore is not to revise the tests but to improve the methods in the different classes in order that the pupils will learn the tools better, which, in this case, meant, in order that the school will show better in the state tests that year. "Besides," he hastened to add as he sat down, "we have to think in terms of our reputation as teachers or someone else will have our jobs. We have enough to do to keep up with our work without having to tell the State Department of Education how to construct the tests."

The above case is typical of the many problems of measurement and evaluation with which the teacher is confronted. It indicates a real difficulty which must be faced if we are to be realistic in attempting to promote a reorganization of the educational system that will meet the requirements of sound objectives and enlightened practices. We cannot be progressive in our teaching and remain basically traditional in our testing. The issue must be faced squarely of whether, in our program of measurement and evaluation, we should be concerned merely with the determina-

tion of the extent to which the pupils have acquired and retained the facts, skills, habits, that constitute the "tools" of thinking, appreciation, and the like; or whether we should be concerned *directly* with the evaluation of the effectiveness of the schools in attaining their objectives, and in so doing, promote as well as measure the achievement of purposes.

That a difficulty such as indicated above should arise at this time is only natural. The cleavage that now exists between theory and practice is not confined to methods of teaching and of selecting subject matter. In fact, the problem of measurement and evaluation in relation to success in any life undertaking is coexistent with life itself. Since education began measurement of a kind has always been employed. In primitive society where children learn the customs, ideals, and occupations of their elders through direct participation in these activities, the rites and ceremonies which mark the end of childhood and youth indicate the extent to which the individual is fitted to participate fully in adult activities. As civilization becomes more complex, special agencies called schools appear increasingly more necessary in order to prepare the young people adequately for effective participation in the affairs of the community. Paradoxical as it may seem, learning becomes more increasingly remote from life; and strangely enough measurement is associated more and more with learning in the abstract and less and less with success in life. The net result is that at the present time education is further away from life than it ever was, and measurement and evaluation, in consequence, deal more and more about less and less. To put it somewhat bluntly, specialists in measurement have often become another vested interest whose major purpose is in refining their instruments of evaluation rather than in making them more valid and effective in measuring, to say nothing of promoting, the achievement of proper educational aims and purposes.

The reason for this is not far to seek. The rapid growth of the testing movement in the last two or three decades especially in this country with its necessary emphasis upon fixed bodies of instructional material and equally fixed objectives, has had the effect of perpetuating the *status quo*. By and large the leaders of the testing movement have been much more concerned with the problem of standardizing tests to fit present subject matter than in readjusting their instruments for testing the learning products which are demanded by the changing objectives of education and of life in general. The educational technician in the field of testing like his kin, the curriculum specialist, rarely questions the existing order. He is concerned, as are many of his "expert" colleagues, with makeshifts;

with efficiency as an end in itself rather than with reconstruction to promote growth in the pupils. He accepts the school subjects regardless of their intrinsic effect in promoting the achievement of the purposes of the school and develops tests for these subjects that have no more relation to life activities outside the school than a man's height has to his appetite.

II. WHAT IS THE WAY OUT?

The remedy is not, however, to abandon the use of tests altogether, but to evaluate present practices with a view to developing new instruments that will measure as well as promote the achievement of the new purposes or objectives of education. If the schools are concerned directly and primarily with the well-rounded development of boys and girls, such as has to do, for instance, with social responsibility, discriminating taste in selecting reading material and dramatic and artistic productions, ability to think reflectively, and the like, testing should likewise be concerned with securing evidences which indicate the extent to which such development takes place from time to time. Furthermore, the tests should aid directly in promoting such development. The practice of teaching first and testing afterwards, and doing research on the side—these three activities quite unrelated in many respects—is reminiscent of the medicine man whose remedy for all kinds of ailments bore no relation to the kinds of diseases treated. It is compartmentalization with a vengeance. What is the way out?

To begin with, let us assume that good teaching is not to be measured in terms of scores in subject matter achievement tests important though these are, but in terms of the quality of pupil thinking and deliberation that takes place in and outside the classroom; not in terms of what the pupils can remember and recite about the characters and events in a story, but in the amount and quality of their appreciation of the development of the plot, and the feeling-tone which they experience as they read about or imagine the interaction of conflicting human motives and incentives; not in their proficiency to repeat the multiplication table or in their ability to recall dates in history or to duplicate recipes in home economics, but in the effectiveness with which they use these tools or concepts in dealing with everyday problems of human concern. If education is to stimulate thinking and promote appreciation,—in short, if it is to be an instrument for the effective and intelligent reconstruction of belief and conduct, all that happens in education should aim at the attainment of this objective directly. In this case the value of the test

lies in the fact that it serves as an *instrument of reconstruction*. Its contribution should be determined not so much by its value in *measuring* growth and reconstruction, as by its intrinsic effect in *promoting* growth and reconstruction. The implications of this point of view are as numerous as they are far-reaching, and we shall therefore take pains to discuss them in some detail.

First, the hide-and-seek relation between the teacher and the pupil should be done away with. The teacher should not hesitate to tell the pupils what the questions will be, in fact, the examination may well be done outside of the class. If the test is well constructed and represents the objectives of the course, the pupils should be permitted, in fact, they should be encouraged to consult any references or anyone including the instructor himself. An hour examination dealing with unexpected questions is not adequate for purposes of enabling the student to do critical and independent thinking on a problem that is of vital concern to him.

Second, if thinking and growth are primarily a series of integrations, the examination should make it possible for the pupils to achieve new integrations. This means that the test should not emphasize the mere recording and recalling of specific facts and principles, but rather the organization and reorganization of these facts and principles in new situations and with reference to problems that are highly significant to the pupils. This does not mean that the facts should be neglected since these are the very basis of integration, but rather that the examination should center on the *use* and *application* of these facts. The same generalization holds true with reference to specific techniques, procedures, and the like.

Third, in "grading" the papers, the outcome of the specific *functioning of the subject matter*, not the mastery of subject matter itself, should be evaluated. For instance, if in the course *consistency of point of view* is emphasized, the test should center on this, at least in part, and the "grade," if it should be given, should reveal the extent to which consistency of point of view is achieved by the student.

Fourth, if thinking is to be done individually, the test cannot require uniformity of answers. This calls for a new type of examination. We emphasize provision for individual differences but the nature of our mass examination system precludes, in fact, it tends to iron out differences. Hence the irony of the situation,—*we provide for individual differences by standardizing individuals and thereby do away with the necessity of providing for whatever differences exist among them*. Furthermore, if thinking is to be individual and critical, it would be worse than unfair to require pupils to think alike.

Fifth, since thinking is developmental in character, the test and the grading system must be developmental also. Grades cannot be averaged anymore than growth and thinking can be averaged. What matters is the final outcome in terms of the achievement of purposes. The installment and averaging plan of grading defeats the purpose of all examina-

tion and even of education as here defined. Reconstruction is not a matter of addition, but of reorganization and re-interpretation.

Sixth, if the examination is to promote as well as measure thinking, it must be studied and evaluated, like any other kind of tool or instrument, from the standpoint of the results obtained. If it does not promote and measure thinking it should be improved until it does or else changed in favor of a new type that does. We talk a great deal about the reconstruction of the educational system without in the least being perturbed by or even concerned about the need for reconstructing our examinations in order to promote or facilitate such reconstruction. So long as examinations remain essentially as they are and have always been, mere tests of subject matter, we can talk about education as reconstruction till we become hoarse without promoting it one iota. Students are more intelligent than we think they are in exercising their "power of intelligent self-direction" in order to pass the test, and that makes all the difference in the world, thinking or no thinking.

Seventh, the examination should call for the functioning of critical and reflective thinking. The emphasis on content should give way to consideration of quality. Instead of "the correct answer," the pupil should strive to achieve a "well-thought-out and critically evaluated answer." If this is to be attained, a new set of criteria of grading examination papers should be used. Some of these are:

a. Evidence of adequacy and thoroughness of acquaintance with, and ability to use basic facts and principles in the solution of vital problems.
b. Ability to organize discussion simply, logically, and effectively.
c. Evidence of critical attitude—questioning validity of data, assumptions and inferences, and of consistency of point of view.

These criteria should be adapted to the grade or age level of the child and phrased accordingly. Other criteria should be used that measure more than knowledge of so-called facts and other lies.

III. APPLICATION TO EDUCATIONAL RESEARCH AND EXPERIMENTATION

Like measurement and evaluation, educational research and experimentation should promote growth and independent thinking. Improving it so that it will does not consist, however, in merely refining an old job. It is concerned primarily about finding new ways of facilitating the achievement of a new set of values or purposes. This involves, not only a re-definition of the meaning and purpose of educational research, but also the invention and use of a basically new kind of evidence and an essentially new set of data. It is a case of the old order changing yielding place to new. Let us elaborate on this in some detail.[2]

[2] For further discussion of the point of view presented in this paper, the reader is referred to an article on "Transfer of Training and Educational Pseudo-Science," which appeared in the May, 1935, issue of *Mathematics Teacher* and in the April, 1935, number of *Educational Administration and Supervision*.

Traditional research in education is involved in a body of assumptions that cannot be defended in fact and has given rise to conflicting results that tend to cancel each other out.[3] It assumes that its main function is the discovery of the inherent nature of the educative process and the preparation of instruments which will enable the individual child to learn subject matter in accordance with the laws of learning thus discovered. The net effect of this is a most effective subordination of the individual to the existing patterns of society. It starts out with the basic thesis that the educative process is uniform and finds that human nature is most flexible and dynamic; it assumes that education is pure science only to discover that it is a high grade technology bordering on the domain of art; its aim is to discover *the* psychology of learning, only to find that there are as many brands of psychology as there are psychologists; it starts out to improve the effectiveness of the teacher, and comes out with a bag of tricks and devices which render the teacher as mechanical as a cash register.

One other effect of the orthodox interpretation of educational research is the unfortunate separation of science and philosophy in thinking of education. This has led to the perennial conflict in American education of two rival camps, one supporting the ultimacy of science, and the other advocating the primacy of philosophy. Science should deal with methods and philosophy with purposes. The advocates of philosophy declare that educational science is a monstrous impossibility (Kilpatrick); on the other hand, the promoters of science point to educational philosophy as a veritable nuisance (Judd). What is the way out?

As before, in connection with measurement and evaluation, the conflict is not resolved by the simple method of elimination or by the convenient habit of compartmentalization, but by the more arduous but vastly more effective process of re-interpretation. Since science and philosophy, in any sense in which these terms are used, are to serve the cause of education, a re-interpretation that is to be effective in removing the conflict should take its clue from the meaning and purpose of education in a democracy. Orthodox research in education limits itself to discovery and description because it assumes, directly or by implication, that education is a mere process of passing on to the next generation

[3] This thesis forms the subject matter of two articles by the present writer in the April and May, 1934, issues of *Educational Administration and Supervision*: "Begging the Question in the Name of Science" (pp. 241-264) and "The Significance of the Statistically Significant" (pp. 231-241).

what is discovered by analysis in terms either of the achievements and standards of the past (traditionalism) or of the social needs of the present (scientific education).

When and if education is not to engage in any basic reconstruction of society, educational research can afford to remain within the confines of routine analysis of existing practices, and consequently to satisfy itself in maintaining or in helping to maintain the *status quo*. On the other hand, if education, as indicated above, should actively participate in the continuous re-making of the social order, educational research must, in like manner, concern itself about the problem of promoting growth and independent thinking in the pupils. To neglect this responsibility is to fail to justify the enormous sums that are being expended for the maintenance of research bureaus and centers all over the country. This will eventually lead to the removal of the artificial boundary line between science and philosophy of education, and the merging of the resources of each in the interest of promoting continuous growth through creative and independent reconstruction of belief and conduct. Incidentally this, in substance, is what we mean by research in education at its best,—as *invention and reconstruction* rather than as mere discovery and description.

Let us develop the application of this point of view to the field of transfer of training. Instead of asking as we do now, "Is transfer possible, how does it take place, and in what amount?"—let the psychologist *per se* ask and answer these questions to his "unprejudiced" satisfaction,—we should ask: "Do we *want* transfer, and if so, what, in terms of ideals, attitudes, beliefs and habits, do we *want* transferred; and what provision *should* we make in method of learning and teaching, administration and the like, in order to bring about transfer in the form and amount that we *desire?* Please notice the change from *is* or *is not* to *should* or *should not*. The problem becomes essentially a technological problem instead of a problem that is purely scientific in character as it is ordinarily regarded by most people. It is not a matter of the discovery of identical elements by analysis of a situation into its varying concomitants, like the biologist discovering the principle of evolution or the physicist discovering the law of gravitation. It is rather a problem of creation, construction, building up of attitudes, ideals and beliefs in the light of a desired social value. It is more of a problem of "human engineering," to borrow a technological phrase, than that of discovering the nature of an electron. Instead of a Davenport, we should have a Luther Burbank; in place of a Faraday we should have a Thomas Edison.

Not that Davenports and Faradays are not important, but *as educators,* our job is not to discover laws, but to make men. Edison created the incandescent lamp and Luther Burbank created a new variety of peas after a prescription from a manufacturer. In like manner, let us create attitudes, ideals, ability to make inferences and to think logically, and even an attitude of "unprejudiced approach to a problem." These are not processes or entities inherent in nature awaiting notice from us, but creations or inventions. We build character,—we do not find it. The child learns to be honest, not by discovering it but by reacting to situations and the situations reacting back in a way that would result in the making over of both the situation and the response. We do not discover that honesty is the best policy, but we make it so that it is the best policy. A pupil learns or should learn his mathematics not by discovering the answers or even by proving them, but by making his calculations in terms of the requirements of the problem, by analyzing the parts and putting them together again in different patterns in order to arrive at a satisfactory solution. The child does not just discover that $22 + 0$ makes 22. He "adds" to it his previous experience with $2 + 0$ and in so doing he transforms it into something that he can deal with satisfactorily. It is not just a matter of reading $2 + 0$ in $22 + 0$ although that may well enter into the situation, but rather the realization of the principle that a naught added to something, whether it be a number or a pound of flesh, does not change its value. Without this principle, which is a meaning and a creation rather than a entity and an abstraction, the pupil may well continue dealing with zero combinations without noticing the "identical elements."

IV. THE UNITY OF THE EDUCATIVE PROCESS

Finally, research and experimentation in education and the measurement and evaluation of results should be made an integral part of the whole educative process and should reveal as well as promote the pupil's awareness of and personal concern about the social implications of his belief and conduct and that of others. This is necessary if measurement is to promote maximum growth in social sensitivity on the part of the pupils. The current practice of teaching first and testing afterwards, and then doing research on the side, represents a tendency to divorce theory and practice of which Dewey complains so much. It also tends to create an artificial gap between the social situation that confronts the pupil and the corresponding ability to deal with its satisfactorily. The net result is *formal testing* of and experimenting on the acquisition of skills, con-

cepts, techniques of procedure, and the like, apart from their *social uses* and *implications*. It is no mystery to anyone that compartmentalization of this sort is the most dangerous obstacle to effective reconstruction. What we need is a re-organization and re-interpretation of the research and testing program so as to make it "a way of life" and be so used and construed by teacher and pupil alike. This is what we mean by "humanizing research and examination" in the concrete.

Let us illustrate the application of these general statements to a concrete situation. Suppose, for instance, that the teacher decides that it is desirable that the pupils should be sensitive to the social implications of the fact that the different races of mankind differ, not only in their capacities but also in their peculiar contributions to the well-being of mankind. This involves several considerations, namely, that different peoples cannot be expected to have the same standards of value, that they are expected to differ significantly in their practices and ways of living, and that, therefore, it may not be fair for one to judge them on the basis merely of one's own experience and social standards in one's own country.

a. First of all, the teacher should determine in what ways pupils may reveal their awareness of and personal concern about the social implications of the fact that the races of mankind differ in their capacities and standards of right and wrong and their disposition and ability to solve problems that arise in connection. It is likely that they already have opinions or practices of their own, right or wrong. What are these practices, opinions, attitudes, and beliefs? How do the pupils react toward foreigners, toward things said about other peoples and about their own people that might indicate how they feel about other peoples? What would be their feeling and attitude toward what other peoples say about the American people, in praise or in criticism of them?

b. Let us grant that the teacher finds a need for more study on the part of the pupils of the facts and generalizations that will make them more intelligently sensitive to the social situations that have been suggested above. It is found, for example, that the feeling, attitude, and beliefs of the pupils are, in the main, founded on mere prejudice or based on wrong information or inference from unreliable sources. The next step is to determine, on the basis of this diagnosis, what scientific generalizations will throw light on the matter. Again, let us assume that biology, anthropology, psychology, and sociology deal with the subject of physical, mental, and social differences of mankind. What these subjects have to say about the problem will then be brought to the attention of the pupils, and since there are likely to be differences among the authorities in the fields indicated, these conflicting opinions, facts,

and interpretations should be brought out in the readings and discussions. The teacher will now have an enormous opportunity to watch the pupils' reactions to what they read. Johnny, let us say, started out with a decidedly strong bias against the Japanese people especially and a disposition in favor of the belief in the inherent superiority of the white race. He now reads conflicting "facts" about the intelligence of the Japanese compared with that of the Americans. Likewise, he also reads something of the different and conflicting biological, anthropological, and sociological studies about the Japanese people as compared with the Americans or with the white race in general. Let us take for granted also that the verdict of science is that much more study should be made than is now available before the problem of the superiority of one race over another can be decided with any degree of certainty.

Let us watch what Johnny would do, say or feel about the conflicting evidence found, and this may be determined by what evidence he selects and what interpretation he makes of contrary and supporting evidence. One of two possibilities in the case of Johnny may result from this exploration. Either Johnny will strengthen his engrained belief or bias, or else he will "break" down and become less sure of his previous stand. If his bias is based on the consideration of all the available facts that are entitled to a hearing and not only on the ones that support his former stand, no one can say that Johnny has not become more socially sensitive to the problem of race differences. If now Johnny will decide more firmly against any kind of intermarriage among the different races most especially between the white and the yellow or brown races, his reconstruction on the basis of belief and reaction becomes nearly complete, and no one can say that he is wrong. All we can say is that apparently he has become more intelligently sensitive about the social problem of race differences. Johnny might, of course, change his previous stand and become more "tolerant." Perhaps he accepts the verdict that he should know more about the matter and wait for more evidence before he finally makes his decision. If this acceptance is based on a thorough study of the conflicting evidence, we can be certain that it is intelligent, and that therefore Johnny in this case has become increasingly more sensitive to the social implications of the problem in the fact that so important an issue cannot be decided offhand.

All degrees of sensitivity will likely be revealed by the thirty pupils in the class, but a wide-awake teacher should have some way of determining whether or not and to what extent (in some measure) his pupils are becoming increasingly more intelligently sensitive to the social implications of the problem of race differences. It is safe to say that he will gain this knowledge, not by

the use of formal tests, but by watching and conveniently recording the reactions of the pupils to his questions, to the readings, to his promptings, and to whatever happens in class and outside of class, that have some significant bearing on the problem. The matter of inference, of interpretation, of testing "on the spot," and of other skillful manipulation of situations which should all be done as these situations arise,—all these will reveal to the intelligent teacher all degrees of social sensitivity on the part of the pupils.

c. Now, if as he goes along, the teacher is so manipulating the situation, provides increasing opportunities for the pupils to revise their stand, he will not only gain insight as to the growth of his pupils in social sensitivity but also creates social sensitiveness that may be lacking. This he will do by presenting conflicting evidence, by questioning the validity of evidence presented, by requiring the pupils to test their conclusions, or in other ways, by making it necessary for the pupils to "stop and consider" before they jump at conclusions. This is what we generally call stimulating thinking. Again at this stage, the teacher will notice increasing social sensitivity or the lack of it as he watches what the pupils do under specific situations. In fact, it should be the paramount function of stimulating thinking to increase the social sensitivity of the pupils by virtue of the fact that thinking increases the span and strengthens the validity of meanings that are attached to facts, data, principles, and other evidences.

d. The need on the part of the teacher of sensitivity to the evidences of social sensitivity on the part of the pupils has already been indicated. To the extent that he is thus sensitive and does something to create situations which will make for greater and increasing sensitivity on the part of the pupils, he becomes a powerful educative agency, not because he furnishes an answer that should be accepted, but that he provides opportunities whereby the pupils may become more intelligent in their choices of beliefs, attitudes or practices. Now, if the teacher has some convenient and adequate means of recording these evidences as he goes along, and in addition, does something in consequence to utilize the evidence to further his purpose, his work would be complete or nearly complete.

V. CONCLUDING STATEMENT

It should be plainly obvious that if education is more than learning facts from books, recording and measuring pupils' progress in school should be radically different from the ordinary method of grading on the basis of subject matter accomplishment. Likewise, research and experi-

mentation, so conceived and applied, become integral and vitally necessary factors in promoting independent reconstruction on the part of the pupils. In the case of Johnny, as indicated, he might have strengthened his prejudice against other races than his own, or else he might have become less intolerant. He could not have remained unaffected. Only a dummy would fail to respond in a way that would show fundamental reconstruction. It can easily be seen that the amount and quality of the change in Johnny would depend a great deal upon what the teacher might do by way of noticing symptoms of change or lack of them, and of taking the necessary steps to provide still better opportunities,—readings, questions, and the like—by which Johnny can test or evaluate his beliefs and conduct. It is in this sense that teaching, testing, and experimenting are one and the same thing,—they are tools to promote, jointly, an ideal for which the schools stand. The education that is thereby provided is the best and most effective type by means of which integration and reconstruction of experience have the greatest opportunity to operate. It is this type of education which will justify itself at any cost to a nation that professes democracy as its guiding ideal.

AN INVESTIGATION IN CHARACTER EDUCATION

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THE purpose of this investigation[1] was twofold: (1) to determine the influence of the elementary and secondary schools on character and (2) to secure recommendations for a character education program.

Three hundred graduate and undergraduate students in the Educational Sociology classes of New York University were asked to evaluate carefully their school experience as a factor in influencing their character. In order to allow the student freedom of expression, two questions were presented, both of a somewhat general nature:

1. As you think back over your public-school experience, what factors do you now feel had a lasting influence, positive and, or, negative upon your personality?
2. In the light of your analysis, what changes, if any, would you make in the attempt to develop a more consciously planned program of character education?

In the tabulation of the data, a sampling of fifty papers was read first in order that the committee might discover what factors and traits were mentioned. The remaining papers were then read using these lists as a basis for checking, and the results were tabulated according to the factors and traits mentioned and the frequency of occurrence of each. A list was kept of the recommendations suggested since they varied so greatly that no one method of grouping could be used.

The results of these analyses were grouped under four headings: Factors influencing character, Favorable traits developed, Unfavorable traits developed, Recommendations suggested by the students.

What are the schoolroom factors which influence character? The following table (Table I) presents the relative importance of such factors as felt by this group. A plus sign indicates a favorable influence and a minus sign an unfavorable influence.

Several significant conclusions can be drawn from this table. The personality of the teacher is considered by this group as of primary importance, with a considerable preponderance on the positive side. Extra-curricular activities although mentioned less frequently were likewise considered a definite positive influence. While the curriculum was

[1] The original investigation was conducted by the following students in the author's class in the Summer Session at New York University: Ralph Bates, Marion V. Brown, Jane Rich, Frieda Schleet, David Speer and Margaret Story.

TABLE I

NUMBER AND PERCENT OF STUDENTS LISTING EACH FACTOR AS A POSITIVE (+) OR NEGATIVE (—) INFLUENCE IN THE DEVELOPMENT OF THEIR CHARACTER

Factor	Number		Percent	
	+	—	+	—
1. Personality of Teacher	169	100	56.3	33.3
2. Curriculum	50	53	16.7	17.7
3. Extra-Curricular Activities	49	25	16.3	8.3
4. Associates	36	41	12.0	13.7
5. Manner of Presentation	24	53	8.0	17.7
6. Scholarship	16	14	5.3	4.7
7. Punishment	16	34	5.3	11.3
8. Out-of-school factors affecting class-room experience, home, church, etc.	119	15	39.7	5.0

second in frequency of mention, a little more than half of those who mentioned the curriculum believed it had a negative influence. Methods of teaching were considered distinctly detrimental in personality development by approximately eighteen percent of the entire group. The forms of punishment used were also considered detrimental by more than twice the number who considered punishment a positive influence. Scholarship was considered of little importance with approximately an equal number feeling that its influence was positive and negative. Out of school factors were given considerable importance, and, by this group, were weighted as a positive influence.

TABLE II

NUMBER AND PERCENT OF TOTAL STUDENTS LISTING EACH FAVORABLE TRAIT DEVELOPED THROUGH THEIR SCHOOL EXPERIENCE

Trait	Frequency	Percent
1. Unselfishness, coöperation, sportsmanship	111	37.0
2. Sympathy, tact, tolerance	106	35.3
3. Diligence, industry, perseverance, persistence	92	30.7
4. Truthfulness, honesty	67	22.3
5. Initiative, desire to achieve	50	16.7
6. Accuracy, neatness, cleanliness	50	16.7
7. Courage, self-control	49	16.3
8. Reliability, dependability, trustworthiness	41	13.7
9. Courtesy, graciousness, magnanimity	39	13.0
10. Obedience, respect	38	12.7
11. Independence, self-reliance, resourcefulness	37	12.3
12. Sincerity, honor	36	12.0
13. Reverence	31	10.3
14. Appreciation of values	30	10.0
15. Promptness, punctuality, using time to advantage	29	9.7
16. Clear-thinking, open-mindedness	25	8.3
17. Good humor, geniality, cheerfulness, optimism	11	3.7
18. Adaptability	10	3.3
19. Conservation, thrift	8	2.7
Total	860	

The second step in the analysis was to determine what specific character traits were influenced by the educative process. Table II presents the frequency of mention of positive traits developed. Table III presents the negative traits.

TABLE III

NUMBER AND PERCENT OF TOTAL STUDENTS LISTING EACH UNFAVORABLE TRAIT DEVELOPED THROUGH THEIR SCHOOL EXPERIENCE

Trait	Frequency	Percent
1. Timidity, fear, inferiority	102	34.0
2. Disobedience, disrespect, defiance	60	20.0
3. Untruthfulness, dishonesty	54	18.0
4. Indolence, irresponsibility	31	10.3
5. Irreverence	28	9.3
6. Selfishness, ego-centrian	27	9.0
7. Discontent	17	5.7
8. Suspiciousness, intolerance	13	4.3
9. Bigotry, snobbishness, conceit	11	3.7
10. Overbearance, surliness	9	3.0
11. Low standards of conduct	9	3.0
12. Ingratitude	7	2.3
Total	368	

As in the analysis of the factors influencing character, a comparison of Tables II and III also indicates that this group felt that their school experiences had been more influential in developing positive character traits than negative ones. In instances such as truthfulness, diligence and friendliness where their opposites: untruthfulness, indolence and snobbishness are listed, there is a preponderance of more than two to one listing such positive traits. The same influence is shown in the fact that the total frequency of mention of positive to negative traits is 860 to 368.

Even in the face of these seemingly gratifying data, the most important fact is that so large a proportion of this select group honestly believed that their school experience had also been a negative influence on their lives by fostering the development of one or more undesirable character traits. That approximately one in three felt that the school experience had fostered timidity, fear, and a sense of inferiority is a serious indictment of public education. These data are in accord with those of Wickman[2] and Yourman[3] in demonstrating the failure of the

[2] Wickman, E. K. *Children's Behavior and Teacher's Attitudes*, Commonwealth Fund.

[3] Yourman, Julius, "Children Identified by Their Teachers as Problems," *Journal of Educational Sociology*, V (February, 1932), pp. 334-343.

teacher to recognize the effect of classroom procedure upon the shy and unaggressive child. That traits are listed such as disrespect, irreverence, intolerance and selfishness, each the antithesis of the real aims of education, gives cause for serious re-evaluation of instruction.

Table IV lists the specific recommendations of this group for the development of a more consciously planned program of character education. Eighty concrete suggestions were made. Only those listed by at least ten percent of the group are included in the table.

TABLE IV

RECOMMENDATIONS SUGGESTED BY THE STUDENTS

Recommendations	Frequency	Percent
1. Increase extra-curricular activities and vitalize their activities	123	41.0
2. Teach character training indirectly through all of the various subjects of the curriculum	77	25.7
3. Select teachers on the basis of personality and love of children rather than on their subject-matter mastery solely	74	24.7
4. Develop a closer and better pupil-teacher relationship	71	23.7
5. Modify present methods of instruction to procure earnest and wholehearted interest and active participation on the part of each pupil	63	21.0
6. Adapt the curriculum to the needs of the child	54	18.0
7. Direct character instruction should be given but only lifelike situations should be presented to prove the value of the lessons taught	48	16.0
8. Use a system of student government	44	14.7
9. Provide a program of individual and vocational guidance	41	12.7
10. Establish closer coöperation between the home and the school	35	11.0
11. Classes should be smaller and thus make possible more individual instruction and attention	33	11.0
12. There should be school drives for character education by means of dramatizations, discussions, publications, contests, projects all originating from the students	31	10.3
13. Teach children to make worthy use of leisure time	30	10.0
14. The school should make a survey of the traits to be developed during school life and assign definite ones to be stressed in each grade	30	10.0

Although comparatively little importance should be attached to relative frequency of recommendations due to the large number of statements and the difficulty of classification, it is significant that nearly half of this group believed that a vital program of extra-curricular activities is an important agency in the development of character. It is also interesting to note the recognition of the importance of an increasing emphasis upon character education, but a marked disagreement as to method. Indirect instruction is recommended by almost exactly the same number of persons as propose direct instruction through life-like situations and school drives.

Other specific proposals for character education included:

1. Elimination of the marking system.
2. Provision for wholesome sex education.
3. Discovery of character needs through a survey of the community.
4. Increase in the number and effectiveness of visiting teachers.

5. Addition of courses in appreciation of motion pictures, radio programs, and the current press including books, magazines and newspapers.
6. Regrouping of children to eliminate retardation.
7. Provision in each school library for suitable reading material and courses of study in character education.
8. Employment of more men in both elementary and high schools and discouragement of "old maid school teachers."
9. Inclusion in the high school curriculum of a comprehensive course in modern social problems.
10. Modification of truancy and school attendance laws to allow greater flexibility on the basis of economic necessities, and social and physiological maturity rather than chronological age.
11. Development of an effective follow-up system to aid the child in his out-of-school and post-school adjustments.
12. Requirement of a complete and rigid physical examination of teachers at least twice a year and the elimination of neurotics through psychological and psychiatric tests.
13. Provision for joyous living and learning through adequately equipped and well-kept buildings and grounds open continuously.

CONCLUSIONS AND SUMMARY

In the light of the findings from the data presented in the tables of this report, the following tentative conclusions may be drawn:

1. In the development of character, the personality of the teacher is of more importance than the subjects taught, for one hundred and sixty-nine listed the former as a favorable influence in comparison with fifty who listed the latter as a favorable influence. This importance of teacher personality is further emphasized by the recommendations where it stands third in the list with a frequency of mention of seventy-four.
2. The great importance of extra-curricular activities is emphasized in two ways:
   (a) It was one of the factors influencing character that was credited with having had a favorable influence.
   (b) It headed the list of recommendations with one hundred and twenty-three students suggesting it.
3. The presentation of subject matter is highly important for more than twice the number of students reported that they were in-

fluenced unfavorably by this factor than those who reported favorably. If this factor is to be made a positive rather than a negative force, it will be necessary to re-evaluate the methods of instruction. In the light of the other recommendations it seems desirable in the opinion of this group increasingly, to use progressive and enlightened methodology emphasizing life-like situations.

4. Provision must be made for individual differences. This can be done by:
   (a) Adapting the curriculum to the needs of the child.
   (b) Smaller classes which will permit individual instruction.
   (c) A program of guidance including careful case study.
5. From these papers it would seem that other influences—such as the home and the church had a more positive influence on character than had the school.
6. Punishment apparently fails in two-thirds of the cases reported, to accomplish positive results in building character.
7. The two traits most frequently mentioned as undesirable products of the school are timidity and inferiority, and their frequent concomitants: disobedience, disrespect and hatred.

Although only tentative conclusions can be drawn from this study since it is at most but a consensus of opinion, it seems apparent that public education has not adequately fulfilled its major objective, the provision for wholesome character development. Smug content and glib phraseology must give way to a frank valuation, and vague and meaningless generalizations to an honest experimental approach in terms of concrete modifications of present practices and procedures. Only through careful and painstaking experiments will education become a truly positive force in constantly molding the ideals and attitudes of our boys and girls.

A TECHNIQUE FOR TESTING UNIFIED CONCEPTS IN SCIENCE

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IN the controversy about the relative value of essay and objective-type tests which continues unabated, little constructive criticism is to be found. A few significant efforts such as those of Tyler[1] at Ohio State University, in biology have appeared. We have been advised by Downing[2] that in the teaching of science, the emphasis should be shifted from the manipulative training to interpretative training. However, no definite suggestions are given for testing the results of the interpretative training.

Educational writings on the secondary level continue to be replete with the idea that students should be taught to think. The procedures in this respect have been many and varied. In the secondary schools, there seems to be a definite trend toward forcing the student into assimilation and organization of science-type subject matter. Some emphasis is being placed on teaching the students how to read during assimilation. A great deal of talking and writing is being done about the teacher as a director of learning. Following the advice about the assimilation technique, there comes a barrage of advice to the effect that students should be taught how to organize material supposedly assimilated. Also, it is possible to find educational literature suggesting that this organization procedure should continue to the point where the student of his own power and volition forms at least tentative judgments from the assimilated materials. Exact procedures for this process are usually lacking.

On the college level the situation is quite different. The student is usually faced with two alternatives. He is either given some instruction on How to Study and English Composition of an analytical type, or he is thrown into a situation where he is bombarded with information which he is supposed to organize. The training for organization in the latter case is incidental and comes mainly from quizzes and final examinations. Obviously, little constructive training can be given in this manner.

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[1] Tyler, Ralph W. "A Generalized Technique for Constructing Achievement Tests," *Educational Research Bulletin*, No. 8 (Columbus, Ohio: Bureau of Educational Research, Ohio State University, 1931), p. 200.

[2] Downing, Elliot R. "An Introduction to the Teaching of Science," *Studies of the Methods of Teaching Science*, (Chicago: The University of Chicago Press, 1934), pp. 126-153.

In the former method, the transfer is the important thing. Since the psychology of learning throws grave doubt on the amount of the transfer, it appears that a student in either case receives little direct aid in organizing his materials.

The testing procedure in the secondary school is certainly not parallel with the instruction procedure. Much of the testing is of the objective-type. It consists merely of sampling statements in various forms. The more detailed this sampling becomes, the less closely it fits the increasing emphasis on assimilation and organization. It is argued that to answer correctly a sample statement removed from its original setting presupposes a knowledge of the original setting. Let us assume that this is correct. Does it follow that the recognition of a statement removed from its former setting implies an ability to recall the setting in such detail as to be able to reproduce the setting? A grave doubt comes to mind at this point. And, is it not this setting or one similarly constructed by the student that is the goal of all science-type instruction? The detailed statements in their inter-relationships demand construction into meaningful wholes.

The testing procedure in higher education is partly objective and partly essay in type. The criticisms above apply equally to objective-type testing on the college level. It seems quite generally admitted that subjective essay-type tests in their present form cannot be evaluated fairly.

Are we presented with a dilemma? Or, have we merely paused in thinking our way through the problem? Why can we not test for information objectively and follow this test with a more objective procedure centered around the actual process of organizing the materials demonstrated by the objective test to be in the students' possession but only in recognitive form?

In writing any theme or thesis certain characteristics of data are desirable. Of course, unity and coherence are expected. The composition procedure on the secondary and college level, however, usually must stop prior to the requiring of such exacting standards as correctness, pertinency, and adequacy of data within specific fields. It must merely hope that the characteristics possible to be developed in composition will be retained and applied in some future time when the student is confronted with these more exacting standards. There seems to be no good reason why all of these characteristics cannot be developed integrally in the subject matter in science teaching.

The authors, Professor Lee of the division of Natural Sciences and Professor Buckingham of the division of Education in Allegheny College, Meadville, Pennsylvania, have attempted such a procedure. Doctor Lee is responsible for developing the unified content of the course "Natural Science Survey" which is taken by all freshmen entering Allegheny College. Doctor Buckingham is responsible for developing the teaching and testing methods of the course. A definite attempt is being made to keep the teaching and testing techniques parallel.

The course consists of a unitary approach to the field of science. All departmental terms such as chemistry, physics, biology, astronomy and geology are treated as pieces of the total picture called science. The materials are presented by lecture and oral quizzes.

The quiz sections are small and are presided over by instructors. An attempt is made in both lectures and quiz sections to develop principles keeping clearly in mind such characteristics as correctness, pertinency and adequacy of data. At first, these principles reside as wholes only in the instructor's way of thinking. Little by little the plan is spread before the student. First, he is given information. Second, he is shown how to put this information together. Third, he is given a complete picture of the principle which he has helped to put together. Great stress is being placed on the process of putting together the information.

During the semester the student is given a true-false test of some three hundred items, in two parts, which is designed to test information only. The test scores are so interpreted. A student scoring low in either part is informed that he does not possess enough information to think with, and is advised to re-study the range of the course which the test covered. At the end of each semester the student is given an organization test. A similar test is taken at the end of the sophomore year.

The purpose of the course is science orientation. Since the purpose of the course is to have a student able to think correctly in a scientific manner, the sophomore test is not concerned with more and more information. Information is supplied on the test form. The student is asked to think scientifically with this information.

In order that the test procedure may be clear to the reader, a sample test filled in by a student and marked by an instructor is printed below.

COMPREHENSIVE EXAMINATION
in
NATURAL SCIENCE SURVEY
(Foundations and the Physical Sciences)

General Instructions

READ CAREFULLY

You are to write a thesis entitled: A Picture of the Universe in Terms of Modern Scientific Concepts.

Before you begin the thesis, work out all other parts of the test. Begin by answering the TRUE-FALSE items. Keep in mind the subject of the thesis while you are answering the true-false items.

I. In the first column (I) at the end of each statement indicate by (+) or (O) whether the foregoing statement is true or false.

	(I)	(II)
The Universe is all there is.	(+)	(+)
The Universe is static.	(O)	(+)
Man's basic reality is experience.	(+)	(+)
Every man is a Universe-Builder.	(+)	(O)
Man is part and parcel of the universe.	(+)	(+)
Science is one result of man's effort at adjustment.	(+)	(+)*
The earliest Universe-Builders had but one god in their universe.	(O)	(O)
Science undertakes the conceptual representation of the universe.	(+)	(+)
Science is based primarily on speculation.	(O)	(O)*
Techniques are methods of attacking problems of adjustment.	(+)	(+)
Two of man's chief objectives have been the search for reality and causality.	(+)	(O)
The overbeliefs of the average man reflect the status of the prevailing science.	(+)*	(O)
All institutions of civilization have kept pace with science.	(O)	(O)
Anthropomorphic concepts embody the attributes or qualities of man.	(+)	(O)
Aristotle believed in a mechanical causality.	(+)*	(O)
Copernicus proposed a geocentric theory of the universe.	(O)	(O)
The contribution of the experimental method is credited to Galileo.	(+)	(+)*
The physical theory of science holds that the universe has only a subjective existence.	(O)	(+)
Science reveals ultimate reality and causality.	(O)	(O)*
An aspect of a thing represents possibilities of experience.	(+)	(+)
The universe has an aspect of *permanence* as well as of *change*.	(+)	(+)
There is no interdependence of the various aspects of a thing.	(O)	(+)
The same fundamental stuff is found in all the explored regions of the universe.	(+)	(+)
The primary *existents* are matter, energy, space, time and ether.	(O)	(O)*
Space and time are physical entities.	(O)	(O)*
The electrical stuff of the universe is that in which, in virtue of which and to which something is always happening.	(+)	(+)
The universe is a series of disconnected events.	(O)	(+)
The phenomena or events of the universe are accounted for in terms of motivated or animated causality.	(O)	(O)*
So-called 'causes' are merely the 'antecedents' of a given effect or phenomenon.	(+)	(+)
The known electromagnetic spectrum is bounded on the end of shortest wave length by cosmic rays and on the end of the longest wave length by wireless telegraph waves.	(O)*	(+)

*Errors are marked with an asterisk.

Radiation consists of electrical particles.	(O)	(+)
Electrons are the units of positive electricity.	(O)	(+)
Electromagnetic waves travel at the rate of 1,040 feet per second.	(O)	(+)
A system is a group of existents conceived to be functioning as a unit.	(+)	(+)
The atom is the basic material system.	(+)	(+)
The universe is a system of independent systems.	(O)	(+)
The universe is illimitable but finite.	(+)	(+)
Plato was the founder of the scientific method.	(O)	(O)
The two essentially different structural forms of the primary stuff of the universe are particles and waves.	(+)	(+)
Life is an aspect of the universe.	(+)	(+)
Protoplasm is the physical basis of life.	(+)	(+)
Death is an entity.	(O)	(O)*
Life is a way of reacting.	(+)	(+)
Mind is an entity.	(O)	(O)*
An individual's knowledge consists of his active, operative experiences.	(O)*	(O)
Man is a closed system.	(O)	(+)
Man is mind plus body.	(O)	(+)
According to modern science there are no fixed frames of reference.	(+)	(+)
The occurrence of phenomena in the physical universe is attributed to the efforts of its various systems to attain a state of equilibrium.	(+)	(+)
The constant redistribution of the stuff of the universe is the basis of the conception described as evolution.	(+)	(+)

II. After having completed the true-false items, go over the statements again and in the second column (II), mark each statement (+) or (O) according to whether or not the material in the statement is really necessary to the presentation of "A Picture of the Universe in Terms of Modern Scientific Concepts."

III. Go over the statements a third time to get a 'birds-eye-view' of the situation and decide whether the facts given are adequate for a complete 'picture.' If the data presented are inadequate, complete the picture by writing additional required facts below.

1. "Quantum theory.
2. Further details of the matter aspect of stuff, such as its organization into
3. electrons, atoms, etc."
4.
5.
6.
7.
8.
9.
10.

IV. Having completed the foregoing assignments, proceed with the writing of the thesis in terms of the above material and such additional material as may be necessary to present a complete and clear picture.

"The modern concept of the universe, that is, all there is, is of interlocking systems, from the universe to the electron, the known extremes at the present time. All of this system of systems is electrical stuff—the fundamental thing of the universe. This stuff is found in innumerable aspects, but all of which come under two headings, radiation and matter.

"When this stuff is found in a loose arrangement it is known as radiation, taking the form of waves. The waves, travelling at a rate of 186,300 miles per second, group themselves together into bundles, or quantum. They move through the attraction of electrical stuff for itself. This radiation, or energy moves from high to low energy factors. To explain, heat is transferred from a hot stove to a piece of ice, but not vice versa. The size of these waves is determined by the speed of their vibration, that is, the speed at which quanta follow quanta in the wave stream. The shorter the wave the faster the vibration; the product of both factors is a constant. The shortest known waves are the cosmic. The electro-magnetic spectrum runs

*Errors are marked with an asterisk.

from the cosmic, thru gamma rays, x-rays, light waves, radio and wireless telegraph waves, to long electro-magnetic waves. But all are fundamentally the same: the only difference is in their length and speed of vibration. It is this aspect of the fundamental stuff which accounts for change and movement in the universe.

"The other aspects is the permanent: matter. Perhaps the smallest known system of this aspect, tho' it is not itself matter, the electron, is nothing but waves pursuing a fixed course, a contracted course. The electrons are built into atoms, the smallest material system, and then into molecules, and into compounds and mixtures and increasingly larger systems. An atom consists of positive charges of electricity counter-balanced by negative, i. e., in the order named, protons and electrons. Atoms, of which there are 92 principal types (elements), are regarded today as either cubical or planetary in form, with the nucleus or center being mostly positive, with electrons on the outside. The attraction of these atoms for each other forms the larger material systems.

"This matter is found in two aspects, inorganic and organic. The principal difference is in the mode of repose. The physical basis for organic matter is protoplasm, a complex compound of ordinary physical stuff. Living systems are built out of this stuff. The highest aspect of organic stuff is the psychic.

"Together with these two concepts must be added those dealing and connected with them, evolution, relativity, and space-time. Evolution is the constant change in the universe, happening everywhere, evolving new systems out of old. Relativity and space-time are modern ideas. Everything is relative from where and when we are. Space-time is not an entity, merely a nominal condition in which electrical stuff is found."

The problem of marking a test of this type is rather complex. Our procedure was as follows:

Doctor Lee and his staff arbitrarily decided that parts I, II, III and IV of the test should have weights of 25, 25, 5, and 45 percent, respectively. It is a simple matter to mark parts I and II by this method. Parts III and IV required the subjective type of marking. The weighting and marking were done without the knowledge or aid of Buckingham.

This sample paper was given a mark of "B." Parts I, II, III, and IV were marked 23, 21, 3, and 40 percent, respectively, making a total of 87 percent. Ideally it would be desirable to consider each desirable characteristic of a test separately. In reality this was done. For example, Table II shows that the average failure marks of "E" and "F" were quite low in both pertinency and thesis. However, the average scores on correctness for the "E" and "F" marks were relatively high. Therefore, the scores in pertinency and thesis must have been the determining factors in passing or failing these students rather than the total marks.

After the marking had been finished, one good paper, one fair paper and one poor paper as determined by the total marks were pulled from the piles at random by Buckingham. Each part score, counting rights only in parts I and II, and using the percents given to parts III and IV, was turned into a fraction of the possible score, using 50 as the fractions' denominators. Table I below gives these results.

TABLE I

Instructor's Mark	Correctness	Pertinency	Adequacy	Thesis
Good paper	50/50	42/50	50/50	44/50
Fair paper	46/50	34/50	40/50	33/50
Poor paper	41/50	21/50	20/50	22/50

One is immediately aware of the uniformly high scores in correctness. The scores in pertinency, adequacy and thesis go down steadily from the good paper to the poor paper. There is a very close resemblance between the scores in pertinency and thesis. The outstanding contrast is between the scores in correctness and the scores in pertinency, adequacy and thesis.

TABLE II

	Number	Correctness	Pertinency	Adequacy	Thesis
A Marks	9	47/50	42/50	39/50	47/50
B Marks	25	44/50	37/50	39/50	42/50
C Marks	62	44/50	35/50	37/50	36/50
D Marks	25	41/50	34/50	40/50	26/50
E Marks	9	36/50	28/50	41/50	22/50
F Marks	2	35/50	27/50	50/50	8/50

Total Marks — 132

Table II gives the mean scores for the A, B, C, D, E and F groups based on 132 marks. The numerators of the fractions were averaged for each group of students receiving "A" marks. This procedure was carried through the B, C, D, E, and F groups. The table should be read using numerators only.

A study of this table shows a fairly wide discrepancy between correctness and pertinency. No trend is clear with respect to adequacy. Wide differences are present between correctness and thesis, and between pertinency and thesis. However, there is closer relationship between pertinency and thesis than between correctness and thesis. Correctness correlates with thesis $.21 \pm .06$ while pertinency correlates with thesis $.25 \pm .05$.

Five conclusions seem warranted:

1. There is the possibility of using one's memory alone to secure a high score in a true-false test.

2. There is the further possibility of securing this high score while simultaneously being unable to see the relationships between itemized

true-false statements and a larger centralized thesis about which the true-false statements should be organized to have meaning.

3. It is necessary to go a step beyond objective testing for correctness alone, in order to be sure that a student possesses both facts and the ability to organize them meaningfully.

4. Since there is as close a relationship between pertinency and thesis as between correctness and thesis, it would seem desirable to use some objective measure concerned with ability to construct inter-relationships in examining students in science.

5. If this method of testing has value in science it should have value in the field of social science to the extent to which procedures in the two fields are parallel. A definite use for the technique might be found in a situation where fact, opinion and propaganda should be separated.

THE EFFECT OF DIRECTIONS AND ARRANGEMENT OF ITEMS ON STUDENT PERFORMANCE IN A TEST

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DISCUSSING the topic of directions for educational tests, Ruch points out that such tests are of achievement and not of the understanding of directions. Therefore, the directions should be simple, understandable, and complete. In this connection he says: "The amount of detail needed will depend largely upon (a) the familiarity of the pupils with tests of the type being given, and (b) the ages or mentality of the pupils."[1]

Further: "The exact phraseology is of small importance; the main issues being clarity, completeness, and the generous use of samples to supplement the written instructions."[2]

In another place Ruch discusses the effect of arranging the items in order of their difficulty, suggesting this as a means of increasing the validity and reliability of a test. Of a test so arranged he says: "The items would become gradually and almost imperceptibly more difficult. They (the students) would finally work, with few delays, into the level of the test where they would be stopped by the limits of their abilities. The time allowed would be better distributed because they met the easy items first, answered them rapidly, and had most of their time left to think about the puzzling difficult items."[3]

The number series test of the Mathematics Aptitude Test, form X, of the Iowa Placement Examinations was used in the experiment reported here to determine the effects of improving directions and arranging items in order of difficulty.

EXPERIMENTAL PROCEDURE

One hundred Mathematics Aptitude Tests of members of the 1932 freshman class of the State University of Iowa were selected at random, and an analysis was made of Part I to determine the difficulty of each item. For this purpose the formula used was: $\frac{\text{successes}}{\text{attempts}} - \frac{\text{omissions}}{N}$

With these results a new series was constructed with the items arranged

[1] Ruch, G. M., *The Objective or New-Type Examination.* (Chicago: Scott, Foresman and Company), p. 166.
[2] *Ibid.*, p. 172.
[3] *Ibid.*, p. 36.

in order of increasing difficulty. A new set of directions for Part I was next prepared. The original directions were:

> *Directions:* Each of the following number series is made up according to a rule. Discover the rule for each example and write the next two terms on the dotted lines. You have 8 minutes for this test.
>
> *Sample:* x, 2x, 4x, 8x ..... 16x 32x

The modified directions read as follows:

> *Directions:* Each of the following number series is made up according to a plan in which there is a definite repeated order. Figure out the plan by which each example is made up and write the next two terms on the dotted lines.
>
> *Sample:* x, 2x, 4x, 8x ..... 16x 32x
>
> In this sample the plan is to multiply each preceding term by two. In the series below the plan may require either addition, subtraction, division, etc., or combinations. You have 8 minutes for this test.

The following three forms of Part I were now ready: I-A—the original form; I-B—items in original order with improved directions; I-C—original directions, items arranged in order of increasing difficulty.

The three forms were then administered to 195 students in the College of Liberal Arts at the State University of Iowa during the latter part of the first semester of the school year 1932-33. All the tests were administered by the writer, except in two classes. In these a trained assistant gave the tests. In order to control factors of companion selection as nearly as possible and to prevent copying, all three forms were distributed in each class in such a way that no two students sitting beside each other worked on the same form. The time limit of eight minutes (given in the original test) was used in the experiment.

EXPERIMENTAL FINDINGS

In the treatment of the results the students were grouped according to the form taken, and the three groups of students tested were matched in terms of their original scores on the test when it was taken as part of the freshman Qualifying Examinations. Only students who were freshmen at the time were used in these groups. It will be seen from Table I that the means and standard deviations in original scores were equivalent for the three groups. Further study of this table reveals that the three

TABLE I

MEANS AND STANDARD DEVIATIONS OF TEST SCORES AND GRADE POINT AVERAGES OF THE THREE GROUPS

Variable	Form A Mean	Form A SD	Form A N	Form B Mean	Form B SD	Form B N	Form C Mean	Form C SD
Original Scores Part I	5.5	3.8	24	5.5	3.8	51	5.5	3.9
Experimental Scores Part I	8.0	3.4	24	7.1	3.8	51	6.5	3.9
Grade Point Average—Semester I	2.13	.61	24	2.10	.63	51	2.15	.46

groups were practically equal in scholastic achievement during the first semester.

The evaluation of these differences, given in Table II,[4] indicates that on the second testing the group who took again the original test had higher achievement than either of the other two groups.

TABLE II

EVALUATION OF DIFFERENCES BETWEEN MEAN EXPERIMENTAL SCORES ON PART I

	Diff	σdiff	$\frac{D}{\sigma diff}$
M_A-M_B	.9	.61	1.5
M_A-M_C	1.5	.70	2.1
M_B-M_C	.6	.62	.97

The students taking form A excelled the other two groups. When tested by the critical ratios, none of the differences was found to be statistically significant. All three groups showed improvement over their original scores.

TABLE III

INTERCORRELATIONS OF ORIGINAL AND EXPERIMENTAL SCORES WITH VARIOUS CRITERIA

	Form A r	Form A PE_r	Form B r	Form B PE_r	Form C r	Form C PE_r
r_{12}	.72	.07	.73	.04	.71	.06
r_{13}	.64	.08	.54	.07	.32	.11
r_{23}	.61	.08	.55	.07	.30	.11
r_{14}	.52	.10	.36	.08	.25	.12
r_{25}	.47	.10	.36	.08	.42	.10
r_{56}	.55	.09	.49	.07	.46	.10
r_{34}	.54	.09	.48	.07	.50	.09

VARIABLES

1. Original Score—Part I
2. Experimental Score—Part I
3. Score—Parts II + III + IV
4. Original Total Score
5. Experimental Total Score
6. Grade Point Average-Sem. I

[4] The formula employed here is that devised by Lindquist and Wilks for the standard error of a difference between means of "matched" groups. It is described in the *Journal of Educational Psychology*, XXII (March, 1931), pp. 197-204.

TABLE IV

EVALUATION OF DIFFERENCES BETWEEN CRITICAL COEFFICIENTS OF CORRELATION GIVEN IN TABLE III

	Groups	Diff	PE$_{diff}$	$\frac{D}{PE_{diff}}$
r_{13}	A–B	.10	.11	.91
	A–C	.32	.14	2.29
	B–C	.22	.13	1.69
r_{23}	A–B	.06	.11	.55
	A–C	.31	.14	2.21
	B–C	.25	.13	1.92
r_{16}	A–B	.16	.13	1.23
	A–C	.27	.16	1.69
	B–C	.11	.16	.69
r_{26}	A–B	.09	.13	.69
	A–C	.05	.14	.36
	B–C	—.06	.13	—.46
r_{46}	A–B	.06	.11	.55
	A–C	.09	.13	.69
	B–C	.03	.12	.25
r_{56}	A–B	.06	.11	.55
	A–C	.04	.13	.31
	B–C	—.02	.11	—.18

VARIABLES

1. Original Score—Part I
2. Experimental Score—Part I
3. Score—Part II + III + IV
4. Original Total Score
5. Experimental Total Score
6. Grade Point Average—Sem. I

Tables III and IV contain correlations of the various factors involved and the evaluation of the differences obtained between the three groups. The prediction of first semester grade point average was taken as criterion of the validity of this test. Since the function of the qualifying examinations is the prediction of first semester achievement, this average may well be taken as the validity criterion for any part of the examinations. No statistically significant differences are to be found among the correlations, although some of the divergences are quite large. In general it will be noted that the form A group is superior to the other two in the various correlations with the criterion. There is one notable exception to this trend. Rearrangement of the items in increasing order of difficulty resulted in an increase of .17 in the correlation between Part I-C scores and grade point averages. Inspection of the scatter diagram indicates that the increase in correlation is due to the creation of two extreme groups. However, the serviceability in prediction under such circumstances would be reduced. This effect of the new item order is more clearly demonstrated by the subsequent data.

Measured in terms of the internal criterion of correlation with the remainder of the test, form A shows superiority over forms B and C.

When the experimental scores on Part I are combined with origin Parts II, III, and IV, the resulting total yields practically the sa correlations with grade point averages as did the original total scores.

TABLE V

INDICES OF EASINESS OF ITEMS FOR THE THREE FORMS*

Formula: $\frac{\text{Successes}}{\text{Attempts}} - \frac{\text{Omits}}{\text{N}}$

Item No.	Form A	Form B	Form C
1	.81	.70	.72 (5)**
2	.70	.55	.70 (1)
3	.73	.65	.65 (9)
4	.83	.69	.53 (4)
5	.89	.79	.62 (3)
6	.41	.20	.50 (7)
7	.74	.55	.39 (8)
8	.60	.59	.53 (2)
9	.74	.73	.39 (11)
10	.39	.21	.38 (10)
11	.68	.46	.11 (6)
12	.39	—.08	—.02 (12)
Mean of total	.85	.79	.78
Mean of first half	.89	.85	.89 (.54)
Mean of second half	.82	.74	.67 (.38)

* All experimental scores are for each form used.

** Numbers in parentheses indicate original order of items corresponding to order Forms A and B.

Table V indicates that there are probably no essential differences be tween forms A and B in the relative difficulty of items. The form items, already arranged in order of increasing difficulty, maintained thi order fairly well during the experiment. Comparison of the means the indices of easiness of the items indicates the superiority of form and shows that modified directions and arrangement of items in orde of difficulty were approximately equal in value in this respect. Th mean index of the first half of each test shows fair equivalence in dif ficulty, but marked differences may be noted in the second half of each Item by item analysis also reveals significant differences. In parenthese after the means of halves of form C are indicated what the means woul be if the items were rearranged in their original order. From this i will be seen that the arrangement of the items in order of observed dif ficulty tended to accentuate their original difficulty as the test progressed

Quite clear-cut is the evidence in Table VI with regard to the per centage of attempts on each item in the three groups. The superiority of form A over form B is indicated throughout. Form C shows a superi ority for the first three items. These are built on exactly the same prin

TABLE VI

NUMBER AND PERCENT WHICH ATTEMPTED A GIVEN ITEM*

Item No.	Form A Attempts No.	Form A Attempts %	Form B Attempts No.	Form B Attempts %	Form C Attempts No.	Form C Attempts %
1	52	96	82	95	34	98
2	46	85	74	86	53	96
3	51	94	76	88	51	93
4	49	91	76	88	45	82
5	52	96	76	88	47	85
6	39	72	54	63	44	80
7	48	89	72	84	48	87
8	48	89	76	88	40	73
9	48	89	74	86	43	78
10	40	74	59	69	37	67
11	44	81	62	72	30	55
12	37	69	36	42	23	42

* All experimental scores for each form used.

ciple, presenting, therefore, a marked element of similarity. However, the number of attempts for the fourth item dropped considerably below those for the fifth and seventh in form C. Throughout the remainder of the test, form C was not equivalent to form B or form A in percentage of attempts.

A final bit of interesting evidence is to be found in Table VII which shows that 58 percent of both B and C groups, as contrasted with 37

TABLE VII

NUMBER AND PERCENTAGE IN EACH GROUP WHICH OMITTED ITEMS (12), OR (11 AND 12) OR (10, 11, AND 12)

Item No.	Form A No.	Form A %	Form B No.	Form B %	Form C No.	Form C %
12	17	37	50	58	32	58
12, 11	7	13	19	22	20	36
12, 11, 10	6	11	14	16	11	20

percent of the A group, omitted the final item. Almost three times as many of the C group as the A group omitted the last two items, and about twice as many C's as A's omitted the last three items. The larger number of omissions on the part of form B students as compared with form A is also of significance.

DISCUSSION OF RESULTS

We have chosen to present the findings above, leaving the discussion until now, because nearly all the data point in the same direction.

1. The effect of improved and lengthened directions is not to increase the easiness of the test, but results instead in greater delay before begin-

ning to work, severely penalizing the student toward the end of the test. It is just possible that these directions may not have been entirely adequate or may have given the students a mental set inimical to best results in performance. However, the evidence from Tables V, VI, and VII seems to indicate that the time factor was the greatest consideration in this particular case, and that the amplified directions contributed nothing toward improved performance or validity.

2. On the supposition that the introduction of the student to material of gradually increasing difficulty would make for better understanding and hence for better performance, it has been a recommended and favorite practice of builders of standardized tests to arrange items in order of difficulty. This assumption may be true for some kinds of material, but the results of the present experiment indicate a certain danger in this practice. It was found from the original item analysis that the items number 2, 8, and 5 of the original test were the easiest. They are constructed on exactly the same principle of number series. As may be seen from Tables IV and V the students operated with a relatively satisfactory amount of success on the first three items of form C, but by the fourth item had apparently acquired a mental set which expected the same type of item, and not finding it resulted in a large number of omissions and much confusion.

Inspection of the tests reveals a good deal of rather aimless scribbling in an attempt to divine the principles involved in the construction of the fourth and remaining items. More attempts at solution were made on the fifth and seventh items than on the fourth; and furthermore, the fifth item was easier than the fourth for this group. That the eighth item should equal the fourth in easiness is rather remarkable, considering the fact that on the other forms it has been shown to be considerably more difficult.

The one increased validity coefficient was found to be due to the creation of two rather distinct groups at the extremes of the scale. However, arrangement of items in order of difficulty in this case unquestionably penalized the students who might normally occupy the middle of the scale.

CONCLUSIONS

Although these conclusions must at present be only tentative, the evidence in their favor is so clear-cut as to warrant our setting them down for purposes of information and by way of a caution to those interested

in building efficient objective tests both for classroom and for standardization purposes.

1. Clear-cut, succinct directions are superior to longer, more detailed explanations. They avoid the dangers of inducing an incorrect mental set on the part of the students, require less time, and are less fatiguing in that they require less mental effort at the beginning of the test when the energy expenditure is probably at its highest point. The evidence from this investigation indicates that even with slightly increased time to offset the lengthened directions the performance would still not be equal to that on the original form.

2. As a problem which demands investigation, that of optimum directions seems to be of considerable importance. The type and phraseology of directions adequate for a given kind of test and level of students is a problem which concerns the teacher or supervisor who constructs objective examinations. Likewise, builders of standardized tests should recognize the importance of adequate, but not cumbersome directions, and of determining by experimental procedures the best directions before marketing their products.

3. Finally, when arranging items in order of difficulty, care should be taken that the items are not grouped according to common basic principles of construction which are not found in succeeding groups. This results in the practice of looking in subsequent groups, for the first principle encountered and operates to reduce student efficiency and the validity and reliability of the test.

INCIDENTAL NUMBER SITUATIONS IN FIRST GRADE

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THE study of incidental number situations in first grade was prompted by the repeated asking of the question, "Do you teach arithmetic in the first grade?" In most instances, the query has connoted a course in formal arithmetic taught in a separate period and involving for the most part the addition and subtractions combinations.

The first grade that was used for this study was given no formal arithmetic; that is, no provision was made for a definite period, no organized course of study was provided, and consequently no standards were set up as to amount or degree of mastery of arithmetic skills and facts. There were, however, numerous activities that provided social functioning of numbers. The phrase, social arithmetic situations, in this study is interpreted as any use of number that arises naturally in the child's school environment.

A social arithmetic situation may be either concrete or abstract. A concrete social situation is one in which the child is made conscious, through the use of objective material, of the meaning of the quantitative terms involved. An abstract social situation is one which, likewise, is inherent in the child's school environment but yet is not made meaningful through objective illustration.

These two types are best illustrated by the following example: A child asks, "How many days vacation do we have?" The teacher replies, "We will look at the calendar." The child counts four days on the calendar and the teacher affirms his answer. At the same time she may also write Thursday, Friday, Saturday, and Sunday on the blackboard. This is a concrete social situation. Contrast the following procedure with the above. The same question is asked: "How many days vacation do we have?" The teacher replies, "Four days." Nothing further is done about it. The child accepts the answer and the day progresses. In the latter instance, the concept of the number four was not made meaningful by objective presentation of the quantitative idea implied. Both of these situations are social. They developed naturally out of the child's school environment. They provided for the functioning of number in satisfying the child's need. The essential difference, then, between socially concrete and socially abstract situations, is whether or not the concrete evidence of the quantitative idea is present to the senses.

This study was conducted over the first three months of the school year of 1933-34. All subjects but the special subjects were taught by teachers-in-training and no effort was made to make these teachers conscious of the problem under scrutiny. The purpose of the study was to determine the number of social situations of either concrete or abstract character that would arise over a definite period of time and to make an analysis of the quantitative vocabulary used. On the basis of a check list constructed by tabulating such situations, it would be possible to suggest improvement of the activities already utilized and, in addition, to suggest others that could be introduced naturally into the child's environment. It seems altogether reasonable to expect that purposeful, yet incidentally introduced, training should more adequately develop number concepts and in so doing simplify difficulties that would be encountered in abstract number in subsequent grades. It would seem advisable that studies similar to this should be repeated at the first grade level and continued into higher grades in order to determine what reënforcement of technical teaching can be gained through the child's natural environment.

Not only might this check list of social arithmetic situations suggest items to be included in an informal course in arithmetic, but it might also suggest a modification in the sequence of topics. Many studies have been reported of the errors made in combinations and of the number of repetitions necessary to attain mastery. The data collected in studies such as this present one would show what number facts and processes seem to be used most frequently. Frequency of social use should undoubtedly be another phase of curriculum-construction that would determine grade-placement.

In order to get a representative sampling of the daily school environment of the pupils, a schedule of observation that would include a cross-section of all subjects taught in first grade was formulated. This schedule was maintained consistently and a stenographic report was kept of every observation made. In this way, some inference could be drawn as to which subjects afforded the greatest number of arithmetic situations. The schedule of observations is as follows:

Time	Subject	Monday	Tuesday	Wednesday	Thursday	Friday
9:00–9:30	Opening Community Life	√	√	√	√	√
9:30–10:00	Reading	√	√	√	√	√
10:15–10:35	Art	√		√		√
10:15–10:35	Physical Ed.		√		√	
1:10–1:30	Language & Lit.	√		√		√
2:45–3:00	Blackboard Writing	√		√		√

FIGURE I. SCHEDULE OF OBSERVATIONS

The first analysis was made to determine the identity and frequency of mention of numerals. This same analysis was carried through for the ordinals. No attempt was made to describe in what type of situation the numeral or ordinal occurred. Some concrete evidence concerning the types of situations is given later in the study. The results of this enumeration of absolute quantitative terms are given in Table I.

TABLE I

NUMERALS AND ORDINALS MENTIONED BY FIRST GRADE PUPILS

Numeral	Times Mentioned	Numeral	Times Mentioned	Numeral	Times Mentioned	Ordinal	Times Mentioned
1	299	11	69	21	33	First	130
2	257	12	68	22	40	Second	31
3	188	13	74	23	33	Third	16
4	145	14	73	24	31	Fourth	6
5	110	15	72	25	14	Fifth	4
6	129	16	58	26	14	6"–28"	1
7	111	17	35	27	3		
8	107	18	35	28	4		
9	87	19	35	29	3		
10	96	20	37	30–78	1 or 2		

There is a rather consistent decrease in the number of times a numeral was mentioned as the magnitude of the number increases. This is also true of the ordinals. In the use of the numeral, there is probably very little significance in this fact except that it substantiates the conclusion that young children in maintaining contact with a normal school environment have little or no use for numbers of any great magnitude.

While the frequency of mention of the ordinal decreased with magnitude, the wide breach between first and second indicates a neglect of the use of the other ordinals. It was found that the word "next" was used twenty times instead of the successive ordinal. Likewise the word "last" was used twelve times when the successive ordinal could have been used.

The situations where this occurred included, among others, the building of an experience story, the reading of an experience story, and selecting children to serve on committees. The teacher would say, "What will we have first in our story?" then either use "next" for the successive sentences or fail to carry through the idea of enumeration at all. Frequently, as has been stated, the teacher would use the word "last" for the final ordinal.

The calendar with accompanying weather conditions was kept daily and the use of the ordinal in this activity was almost negligible, as one can readily see from Table I of ordinals mentioned. The ordinals from six to twenty-eight were mentioned only once. The teacher usually gave the numerals instead of the ordinal after the first few days of the month for example: "What day is today?" Children: "Tuesday." Teacher: "Can you find the number?" Children: "Yes, today is number twelve."

There were numerous situations of rational counting, which means the enumeration of actual objects. One hundred ninety instances were recorded with numbers ranging in magnitude from one to twenty-seven. There was wide variety in the type of situations, the most representative of which are cited below.

A daily attendance chart was kept, this activity very often affording five number situations in a single morning. (1) The attendance chart involved counting the boys and girls separately and collectively. The children selected the proper numbers and fitted them into the chart. (2) If a child came in late, the results were altered and new numbers were selected. (3) The calendar provided opportunity to count the sunny, snowy or windy days in a month. (4) There were also vacation days to count, days spent in school and the number of days until a holiday. (5) There were the number of people on committees and the number of things listed for accomplishment. (6) In reading there were the number of pages to read in a given story and the number of repetitions of certain sentences, phrases and words. (7) Oftentimes counting was used to locate the page on which the lesson for the day occurred. Many of these activities involved not only the counting but recognition of the number resulting from the counting. (8) During the fall, the children gave a party for their mothers as a part of their home activity. The planning of this party necessitated counting paper plates, napkins, jelly tarts and cups for milk and tea. The presentation of an assembly program for the mothers gave further opportunity for counting in order to determine how many things should be included in the program and how many programs would it take to give each mother one.

There was no evidence that any other type of counting besides rational arises naturally from the child's environment. There was, however, abundant evidence that rational counting is a normal outgrowth of the child's environment.

In keeping the daily attendance chart, situations arose that involved the concepts of addition and subtraction. These situations were always

concrete as the children and desks afforded objective material for counting. Often the teacher wrote the figures on the board in the combination form, thus adding further concreteness to the situation. The enumeration of these situations revealed forty-two in addition and eighteen in subtraction. The fact that more than twice as many addition situations as subtraction were recorded may be a significant one. Further studies might help to prove that the concept of, and use of, addition is naturally a part of the child's growth. If this be true, the sequence of topics for teaching would be changed. It may be due in part to the traditional notion in the minds of many that subtraction is more difficult than addition. The teacher may have been influenced by this idea.

A situation that involved the concept of addition would be the instance of child coming late to school. The number of boys and girls separately would be changed by adding one more and likewise the number of the group collectively. At first, this was done by counting but later the children seemed to have mastered the combination involved. Another example of this would be the selection of a committee. Eight children are needed for a piece of work; six have been selected. How many more are needed to make eight?

Subtraction situations were introduced when the teacher would have the children count the absentees and that number would be taken away from the total attendance number. Again counting was relied on in the beginning. This idea was carried out also with the boys and girls separately.

It was interesting to note that the numbers used in the attendance record were of much greater magnitude than are commonly used to introduce either addition or subtraction in the ordinary school room procedure. However, the children were able to manipulate these numbers as readily as they might do numbers of much less magnitude.

In recent studies some attention has been given to quantitative vocabulary that is used in textbooks and courses of study. The present investigation, on the contrary, has attempted to determine the quantitative vocabulary that is naturally included in the child's conversation. An attempt was made to make a stenographic report of the children's conversation during the periods of observation.[1] Only the quantitative terms recorded were used for the vocabulary study. Therefore, this study has not been unduly influenced by using previously devised check lists of word usage. It is interesting to notice that there is considerable

[1] See Figure 1.

correspondence in the words included in the two types of lists. The vocabulary given in Table II below is to supplement the list of numerical terms given in Table I. Possibly, it is significant that no fractional term was used more than five times. These were "part" and "half."

TABLE II

VOCABULARY AND FREQUENCY OF MENTION

Word	Times Mentioned	Word	Times Mentioned	Word	Times Mentioned
All	69	Bigger	5	Longer	3
Little	49	Part	5	Less	3
Big	47	Half	5	Biggest	2
More	28	A Lot or Lots	5	Small	2
Whole	27	Tall	4	Large	2
Long	24	Much	4	Smaller	2
		Most	3	Higher	2

The children's comments revealed that they have a feeling for, a consciousness of, numbers and their function. The following exposition includes only the spontaneous reactions of the children. Every instance where the suggestion was initiated by the teacher has been disregarded. These comments seem to group themselves naturally into four classes; namely, matching, use of ordinals, use of quantitative terms, and use of fractional concepts. The use of quantitative terms heads the list with twenty-one instances, matching is next with ten, use of ordinals, eight, and use of fractional concepts, three. A list of representative comments is given below.

I. Matching
   1. "The same day as my birthday."
   2. "That's just how old I am."
   3. "That's the same day as my birthday; only it's May."
   4. "It's just the same number we had yesterday."
   5. "Twenty-three children and it's the 23rd of November."
   6. "Twenty-two children and page 22."

II. Use of ordinals.
   1. "My house is on 3rd street."
   2. "Nine more days to Christmas and the tenth day is Christmas."
   3. "I liked the second story."
   4. "It is the fifth one."
   5. "That's the third kite."

III. Use of quantitative terms.
   1. "Just one more day until Hallowe'en."
   2. "We will have four days vacation."
   3. "That's the most we've had for a long time."

4. "We have had many more today."
5. "There are more girls than boys."
6. "I think this will be less than eight."
7. "If that boy who sits over there was here we would have eleven."

IV. Use of fractional concepts.

1. "I've got mine half sewed."
2. "Two short ones would be the same as one long one wouldn't it?"

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child'
feeling that subtraction is more difficult.

7. That the children were able to handle numbers much larger than the traditional numbers in beginning addition and subtraction seems to indicate that meaning is more significant than the magnitude of the number.

8. The check list of quantitative vocabulary taken from the child's conversation corresponds somewhat with recent check lists made from usage in textbooks and courses of study. A much more intensive study of quantitative terms should be made from the child's conversation. A check should be made as to what is the child's concept of each term.

9. The idea of fractions has no great use for children at the first grade level. This may be due to the teacher. She may feel it is too

4. "We have had many more today."
5. "There are more girls than boys."
6. "I think this will be less than eight."
7. "If that boy who sits over there was here we would have eleven."

IV. Use of fractional concepts.

1. "I've got mine half sewed."
2. "Two short ones would be the same as one long one wouldn't it?"
3. "We've just a half a day left to practice."

While some attempt has been made to describe the background and specific occasion for social arithmetic situations in this study, it has not been possible to be all-inclusive. In spite of this fact, enough has been included to warrant the following conclusions and recommendations.

1. It is interesting and most significant to find that the concrete use of number at the first grade level far exceeded the abstract use in social situations. It was found that there were 514 concrete social situations as contrasted with 64 abstract. This is an impressive difference and should give rise to some thoughtful consideration by curriculum makers.

2. Further studies should be made in subsequent grades in order to determine what re-enforcement of technical teaching can be gained through an abundance of incidental experience.

3. Frequency of use is undoubtedly an important phase of curriculum-construction. Further evidence might alter the sequence of topics to be taught.

4. There seemed to be a definite neglect of the use of the ordinals beyond "first." The activities that could be used to develop the concept of the ordinal were in many instances not utilized at all.

5. Children at the first grade level appear to have little or no use for any type of counting other than rational. The numerous situations of rational counting lead one to believe that rational counting is a natural outgrowth of a child's environment.

6. The fact that addition situations occurred many more times than subtraction may tend to prove that addition is a natural part of the child's growth. The teacher may have influenced the results by the feeling that subtraction is more difficult.

7. That the children were able to handle numbers much larger than the traditional numbers in beginning addition and subtraction seems to indicate that meaning is more significant than the magnitude of the number.

8. The check list of quantitative vocabulary taken from the child's conversation corresponds somewhat with recent check lists made from usage in textbooks and courses of study. A much more intensive study of quantitative terms should be made from the child's conversation. A check should be made as to what is the child's concept of each term.

9. The idea of fractions has no great use for children at the first grade level. This may be due to the teacher. She may feel it is too difficult for first grade children.

10. The comments of the children show that they are conscious of numbers and their function at the first grade level.

11. It is suggested that further studies be made to determine what activities afford the most number situations and at the same time are a natural outgrowth of the child's environment. In this study the opening exercises and community life were richest in number situations.

EFFECT OF THE RETAIL SALES TAX ON THE RELATIVE ABILITY OF THE STATES TO SUPPORT EDUCATION: A STUDY IN FEDERAL RELATIONS

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THE acceptability of the retail sales tax as a source of tax revenue is at present an exceedingly live issue. Tax experts generally oppose it.[1] Approximately 30 states have a sales tax in one form or another. The purpose of the following paragraphs is not to discuss the acceptability of the retail sales tax as a fiscal measure but to analyze its effects upon the relative ability of the states to support public elementary and secondary education. The analysis, therefore, seeks to assist in the perfection of a technique for the measurement of the relative ability of the states to support education. It is offered as one of the steps necessary in forming a judgment of the merits of the sales tax as an item in the measurement of the relative ability of the states.

In order to make the foregoing analysis it is necessary first to know the status of the states in relative ability to support education, excluding the sales tax. The effects of the retail sales tax can then be calculated. Data based on the foregoing procedure have become available recently.[2] According to the procedure used in the study, the ability of the states to support education, under a system of state and local taxation based on the Model Tax Plan[3] as prepared by a group of tax experts acting as a committee of the National Tax Association, was first determined. The study covered a period of years from 1922 to 1932.

After determining the ability of the states to support education under the foregoing tax plan, the amount of tax revenue which each state could have collected during this decade under a uniform retail sales tax was calculated. A tax rate of 2 percent was used. The influence which this additional tax revenue would have upon the relative ability of the states to support education was then determined in the following manner: First, the amount of tax revenue available for educa-

[1] Haig, Robert M., and Shoup, Carl. *The Retail Sales Tax in the American States.* New York: Columbia University Press, 1934.
Seligman, Edwin R. A. *Studies in Public Finance.* New York: The Macmillan Company, 1925.

[2] Chism, Leslie L. *The Ability of the States to Finance Public Schools.* New York: Bureau of Publications, Teachers College, Columbia University, 1936.

[3] National Tax Association. *Second Report on a Plan of a Model System of State and Local Taxation.* Lancaster, Pa.: Wickersham Printing Company, 1933.

tion—under a system of taxation based on the Model Tax Plan—in the forty-eight states as a whole was divided by the number of units of educational load to be carried in the forty-eight states as a whole.[4] This quotient was represented by an index of 1.00. Second, an index was obtained for each state by dividing the amount of revenue available per unit of educational load to be carried in each state by the amount of revenue available per unit of educational load in the forty-eight states as a whole. The indices obtained by the foregoing steps are shown in columns 2 and 6 of Table 1. Third, the amount of tax revenue—under a system of taxation based on the Model Tax Plan plus a retail sales tax as mentioned in the foregoing discussion—available per unit of educational load was determined for the forty-eight states as a whole. This latter amount was then represented by an index of 1.00. Fourth, an index was determined for each state by dividing the amount of revenue available per unit of educational load in each state by the amount of revenue available per unit of educatioanl load in the forty-eight states as a whole. The indices obtained in steps three and four are presented in columns 3 and 7 of Table I.

According to the data in Table I, the retail sales tax decreases the range in relative ability of the states to support education. The range is from 1.94 to .32 (more than 6 to 1) if the sales tax is omitted, and 1.81 to .35 if the retail sales tax is included. This means that the poorest states could have raised more tax revenue from the retail sales tax in proportion to their educational need than the richest states. That is another way of saying that the people of the poorest states find it necessary to spend a larger proportion of their resources for articles taxed under the retail sales tax.

An analysis of the effects of the retail sales tax on individual states is shown in columns 4 and 8 of Table I. A minus or a plus sign is placed opposite those states for which the index of relative ability was influenced by more than .0 as a result of the inclusion of the sales tax. In case the change was only .01 it was thought to be so small as to be unimportant. It should be pointed out that a loss in relative ability (minus sign) means the given state is less able to support education out of its own resources and consequently deserves more federal aid under a defensible federal equalization program for education. The opposite is

[4] The measure of educationnal load used in the present investigation was based on a combined consideration of such factors as average daily attendance, increased cost of secondary education as compared to that of elementary education, and sparcity of population.

TABLE I

EFFECT OF RETAIL SALES TAX ON RELATIVE ABILITY OF THE STATES TO SUPPORT EDUCATION, 1922-1932

State	Index of Ability if Sales Tax Is		Effect of Sales Tax on Relative Ability	State	Index of Ability if Sales Tax Is		Effect of Sales Tax on Relative Ability
	Omitted	Included			Omitted	Included	
1	2	3	4	5	6	7	8
Nevada	1.94	1.81	—	Nebraska	.96	.92	—
New York	1.69	1.67	—	West Virginia	.95	.91	—
Rhode Island	1.49	1.50		Indiana	.93	.91	—
New Jersey	1.48	1.45	—	Vermont	.86	.95	+
Massachusetts	1.47	1.48		Colorado	.86	.87	
Connecticut	1.47	1.44	—	Kansas	.85	.83	—
New Hampshire	1.40	1.39		Wyoming	.83	.84	
Illinois	1.30	1.29		Florida	.79	.81	+
Delaware	1.29	1.29		North Dakota	.73	.71	—
Pennsylvania	1.28	1.26	—	Idaho	.72	.72	
California	1.21	1.24	+	Virginia	.68	.69	
Maryland	1.20	1.21		Utah	.67	.67	
Iowa	1.18	1.11	—	Louisiana	.64	.67	+
Ohio	1.16	1.16		New Mexico	.59	.60	
Washington	1.13	1.12		Tennessee	.56	.59	+
Michigan	1.08	1.10	+	Texas	.56	.59	+
Oregon	1.04	1.02	—	Oklahoma	.53	.56	+
Minnesota	1.04	1.03		Kentucky	.52	.55	+
United States	1.00	1.00					
Montana	.99	.99		North Carolina	.45	.47	+
Arizona	.98	.99		Georgia	.44	.48	+
Wisconsin	.97	.98		Arkansas	.44	.47	+
South Dakota	.97	.93	—	South Carolina	.41	.43	+
Missouri	.97	.97		Alabama	.40	.44	+
Maine	.97	.98		Mississippi	.32	.35	+

true in case of a plus sign. The data show that none of the richest ten states gained in relative ablity. On the other hand, the poorest ten states each gained .02 or more when the sales tax was included. Only five other states—i. e., after excluding the ten poorest—gained in relative ability by including the sales tax.

The retail sales tax as an item in the measurement of the relative ability of the states to support education produces two major results. First, it reduces the range in relative ability by increasing the ability of the poorest state and decreasing the ability of the richest state. Second, it places a penalty on each of the ten poorest states. Only five remaining states are penalized. Thirteen states are favored when the sales tax is included, and twenty states are uninfluenced.

EDITORIAL

PRINCIPLES VS. TECHNIQUE IN TEACHING

When one comes to do a thing, it is always done in some particular way. There may be, for example, several ways of tying one's shoes—each about as good as another—but when one's shoes are tied they must be tied in some particular manner. These specific ways of doing things—tying one's shoes, teaching a sixth grade class in arithmetic, playing a violin, etc., are commonly called techniques.

Naturally when one is learning to do a thing, since it must be done in some particular way, it is this way of doing it that one desires to learn. Thus the emphasis upon techniques of teaching, techniques in music, form in athletics, etc. With this thought in mind, teachers, as a rule, are very critical of college professors of education, textbook writers and supervisors, because they do not more frequently tell them these specific ways of doing things, and thereby lies one of the interesting problems of education and, for that matter, almost any form of human activity.

When a task is simple, probably the best way to teach it is to teach it on the technique level. Such, however, does not appear to be the case with more complex activities, such as teaching, getting along with others, and operating a government. The fundamental assumption underlying the technique approach is that the next time one approaches a task of a given class it will be like in detail to the last, etc. This, of course, is not at all true, particularly of the more complex forms of behavior, and the presumption that these situations are alike in detail gives rise to many mistakes of method. In teaching, for example, pupils are different, not merely from class to class and among themselves, but from day to day; the conditions under which one works from time to time and from place to place are different; one's purposes differ from time to time; one may or may not have certain equipment, supplies or materials with which to work; then the teachers themselves differ. In a technique approach to teaching one must treat all of these very different situations as though they were alike, or teach many techniques.

The greatest difficulty with the technique approach, and the thing of great concern to both field workers and to research workers, comes not

here, however, but in the field of the discovery and the evaluation of new techniques. Suppose that one has a way of doing something. How does one know whether or not this is the best way? One may, of course, carry on comparative investigations for this purpose, but inasmuch as the ways of performing a complex activity are very many (possibly infinite), there would have to be many investigations. This may constitute a real difficulty. Again, if one had one way of doing a thing and desired to discover another, how would one go about discovering another, a third, or a fourth? In the absence of generalized values, the process would be wholly one of trial and error, determined solely by the results.

A principle, it seems to the writer, is a verbalized statement of an observed uniformity relative to some class of objects. It may pertain to essential characteristics, rules of actions or conditions. If I look at a clock, a chair, a bed, and a rug, and observe that they are all household furnishings, I indicate a common characteristic. If I look at an efficient activity in teaching, learning, operating a street car, or running a buzz saw, and observe that all of the participants are interested in what they are doing, I indicate a common condition for effective activity of this type. These observed uniformities constitute the means by which one proceeds from one situation to another. They may arise either from personal experiences based upon incidental observation or from systematic investigation. They are all of the same order except the precautions taken against error in the latter are ordinarily much more exacting than in the former. They offer means by which one comes to the intelligent discovery of new techniques; and in the long run they offer a great economy of effort, first, because they restrict the field of search, and secondly, because they make the search something more than a trial and error process.

Sometimes workers in the field of education are criticized by scholars in other fields as being superficial. Seeing the practical task before them, educationalists have resented this criticism; no one wants to be called superficial. This criticism arises, however, out of the differences in the manner in which techniques are treated in the field of education and elsewhere. University courses in government, for example, are courses in the principles of government—not techniques. Courses in money and banking are courses in the principles of money and banking, etc. As a matter of fact, practically all of the well-established university subjects, such as history, philosophy, science, sociology, politics, and economics, are built around principles and not techniques. This may or may not be the

best policy, but this difference in practice indicates that there is here, nevertheless, a problem. Techniques, important as they are, constitute the ever-changing, fleeting, fluctuating aspect of life or of any field of action. Underlying these are their supposedly more permanent characteristics that constitute the principles of human activity, and the determiners of success and failure. In this sense much that is offered in the name of education is superficial.

There are very few problems in the field of education of more practical concern than the problem of bridging this gap between principles and techniques.

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REVIEWS

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HARTMANN, GEORGE W. *Gestalt Psychology* (New York: The Ronald Press Co., 1935), pp. XIII + 325.

Gestalt psychology is no longer of interest to the academic psychologist only. It fits well with changes that were occurring in education before the psychological movement was heard of and is having profound effect upon educational methods and objectives. On this account educators should find such a book as that of Hartmann of great value.

There is first an excellent discussion of the development of the Gestalt point of view. Reference is made to nineteenth century psychologists and philosophers who expressed disagreement with a purely atomistic psychology. Wertheimer's experimental paper on "Perception of Apparent Movement," published in 1912, is reviewed at length as the starting point for the current Gestalt movement.

In part II the theoretical foundations of Gestalt are examined. The physical and naturalistic concepts of Köhler, the physiological work of Lashley, Driesch, Weiss and Coghill, and the philosophical concepts of Wheeler are reviewed. They agree in concluding that natural phenomena, both animate and inanimate, occur in wholes which cannot be understood as a summation or addition of parts. In general the Aristotelian attitude toward psychology must be abandoned.

Part III reviews the experimental attack of the Gestalt psychologists upon the problems of perception, memory, learning, reasoning, insight, emotion, and will. Learning is found to be more a matter of reorganization of perception than direct reorganization of action. The association theory is rejected as an explanation of memory and learning. "The major defect of associationism was its implicit assumption that two things or processes can interact quite independently of their properties, an assumption which is contradicted by the data of every other natural science." (p. 158)

The Gestalt psychology flatly opposes "chance" theories of learning. "There is nothing in the reactions of an infant to indicate that it builds up its acquaintance with 'objects' by uniting an original chaos of sensations. The fact that most of his definitions are in terms of use shows how hard it is for a child to form a concept of a thing outside its 'setting.' His number ideas, too, originally refer to groups and not to arithmetic units. Mental life, even at the start, is always more or less well-organized." (pp. 168-9). Trial and error learning, learning by use, effect, and the like are discarded as explanatory concepts. Insight takes the place of all these as the key word in describing learning. Ogden has formulated new laws of learning to replace those stated by the association psychologists.

Gestalt theory is likewise modifying formal logic and is furnishing new principles for explaining reasoning. Here, as in the explanation of learning, insight is the key word.

Part IV suggests applications of the Gestalt point of view to mental pathology, industry, and education. The emphasis upon the genetic priority of wholes should be a guide for both methods and objectives of training. Not habit formation but understanding becomes the aim and method of education. Not drill upon elements and fundamentals but activity units defined by goals become the means of teaching. Intelligence tests are criticized because of their failure to get at the child's ability to develop new configurations. Educational research based upon the principle of the single variable is discarded. There is a teacher-method-subject-pupil configuration that cannot be dissolved in the hunt for best methods. In general, the Gestalt theory favors "progressive" education, the "activity" movement, purposeful learning, consideration of the whole pupil and the like.

The book ends with a summary of the criticisms that have been directed against the Gestalt school. In general, Hartmann has given a very readable presentation of the main facts and principles of the Gestalt psychology. He has been concerned with sympathetic exposition and interpretation rather than propaganda. His book can be read with profit by teachers and research workers in education as well as by those whose interests are in psychology as a science.

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WARREN, HOWARD C., Editor. *A Dictionary of Psychology* (New York: Houghton-Mifflin Company, 1934), pp. x + 372.

Of all books, a dictionary is probably the most difficult to review. As someone has said there is too little plot or action. One may, however, call attention to certain salient features.

Only two dictionaries of psychology in English have preceded the Warren: Baldwin's two volume work of the nineties and the present reviewer's *Student's Dictionary of Psychological Terms.* Baldwin's is philosophical, at times even in its psychology. Warren includes philosophical terms only if they seem of the sort a psychologist is likely to use. (I should judge that there are more biological terms than philosophical—as there should be.) Most of the articles in Baldwin are long and encyclopedic. Warren gives us a *defining* dictionary. Facts and the inter-relations of facts are not discussed; they exist only to be referred to with maximum precision. Practically all the entries are short.

Shorter even than in my *Student's Dictionary* and rightly so. For Warren addresses himself to the expert in phychology who may be expected to understand a clear statement of the utmost brevity. Most of the time he contents himself with a statement of various meanings without comment. Occasionally he criticizes an atrocious violation of terminological good sense which bids fair to become current, but this is rare.

Seldom, moreover, is there overt recognition of the prism of meanings which grade into each other like the spectral colors. Instead, there is the effort to fix each important meaning much as we fix the four principal colors of the color square by naming them. The inter-relations of meanings and usages received only a limited treatment. In my own little book, there is a careful attempt to make these inter-relations clear and this has been a useful feature, if one may judge from comments received. But mine was after all an individual effort. It is a pity that Warren, with his band of authoritative collaborators and still more with his own ripe scholarship and truly

extraordinary sensitiveness to terminological problems, saw fit to eliminate this feature. It means that the Warren is more of a writer's than a reader's guide.

Over 100 collaborators revised or wrote the definitions. Each definition was carefully considered by at least two experts in the field. An astonishingly large proportion were first assembled and phrased by Warren himself, who also personally took final responsibility for each statement. He had collaborators but this was no joint-authorship project; it is truly Warren's own. The work of the collaborators, however, gives to the book an authoritative character and contributes to a high general level of accuracy.

Of course there are unevennesses, omissions and even downright errors. While behavioristic terms are fairly defined, certain "neutral" expressions are defined in mentalistic terms exclusively—often when a definition in terms acceptable to both behaviorist and mentalist is possible. Terms from education are not too adequately dealt with but here the editor had a peculiarly difficult task. These terms are mostly phrases built up of fairly ordinary words given a quasi-technical meaning. They vary so tremendously from author to author that they become proper names rather than technical terms. The educational research worker, however, will find a fair percent of his working vocabulary adequately and helpfully defined. The reviewer has heard most criticism of the terms in abnormal psychology. Many Freudian terms are given definitions which arouse the Freudian cult to frenzy.

On all reasonably debatable points, however, the mere existence of an authoritative pronouncement tends actually to create uniformity of usage. Even when we feel that the editor has plumped for the inferior of two choices we shall do well to go along, because uniformity of usage is itself one of the chief desiderata. One must be very sure of his ground, henceforth, if he ventures upon a usage opposed to those sanctioned by *Warren's Dictionary*.

An appendix has twenty-one lists and tables of the most varied usefulness. Some are essentially outlines for study (e.g., the table of errors in experiment) others are valuable for reference (e.g., the statistical formulae) and many could well have been omitted, (e.g., the lists of phobias, which to be at all useful should be arranged according to the dreaded object—but why do we have to speak the dreadful jargon of synthetic Greek just because physicians got off to a bad start in that direction; the list of musical intervals, the extremely incomplete list of complexes, the list of fallacies.) The list of Topographical Terms gives a logical scheme which would be useful if adhered to (as it will not be). The long list of nervous system terms unnecessarily duplicates the body of the dictionary. The German and French Glossaries are probably too brief for most uses but should be occasionally convenient.

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HAUPT, GEORGE W. *An Experimental Application of the Philosophy of Science Teaching in an Elementary School.* Contributions to Education, No. 633 (New York: Bureau of Publications, Teachers College, Columbia University, 1935), pp. vi + 109.

To obtain the data on which this thesis is based lessons were taught to each of the six grades of Horace Mann Elementary School with a view to giving ultimately an understanding of the generalization that "Green plants convert the energy of light into the energy of food

and fuel." There were five twenty-minute lessons in Grade I, six in II and III; nine thirty-minute lessons in Grade IV, four in V and ten in VI.

The pupils of Grade I had in their schoolroom a potted plant and a crayon drawing of such a plant with the parts labeled. They placed green plants near a window to see that the leaves turned toward the light. Other plants were put in the dark to show that they turned yellow, resumed their green when restored to the light but died if left in the dark. Pupils sprouted potatoes, one in light, one in dark. They saw the film "Sunshine." That plants need water, soil, sun, air and food was discussed: also that animals get their food from plants. The following items of instruction and illustrative materials will show what was added to the above in the later grades. Grade II, the balanced aquarium, the radiometer in bright and diffuse light. Grade III. Pupils told that energy from sunlight is stored in the plant as food. Grade IV. Shown Eastman Education-film "Energy from Sunlight": spectrum when sunlight is passed through prism. Cross section of leaf under compound microscope and blackboard drawing of same with parts labelled. Grades V and VI. Usually each grade received all instructions given the lower grades and some in addition but Grade V did not see the leaf cross section or the drawing of the same. Grades V and VI did discuss the Leaf as a food factory.

Tests were given to the pupils both before and after instruction. There follows a table of a few of the statements in the tests and the percentage of the pupils in each grade who recognized them as correct.

There are two different philosophies of science instruction for children based upon different psychological assumptions (1) that experiences should be provided which permit of interpretation and explanation contributory to an understanding of large generalizations; (2) children's experiences should consist mainly of observation" (p. 12). "This study was made in order to secure experimental data bearing upon certain basic assumptions" (p. 101) of the first of these philosophies. One assumption is that its application necessitates particular kinds of mental processes. A second assumption is that children are capable of these processes. A third assumption, that gradation of the course of study can be effected by the objective type of aim rather than the aim aesthetic at the lower grade levels and economic in the upper grades or use the biological materials in the lower grades, the physical in the upper. (Abbreviated from p. 101 but to my mind no more confusing than the fuller statement).

The mental process to which considerable attention is devoted is generalization and it is claimed that these children all generalize. A definition of the term is adopted however which is not the one in

	Grades					
	I	II	III	IV	V	VI
Plants get yellow when there is no sunshine:						
Before instruction	22	10	82	5	12	17
After instruction	53	28	82	43	12	50
Plants get green in the light:						
	0	5	0	46	18	42
	81	63	77	59	12	11
Plants turn to the window to get light because light makes them strong:						
	0	10	77	15	6	14
	56	95	86	64	12	25
We get our food from plants:						
	0	0	0	0	0	0
	66	93	73	8	27	39
Plants make food:						
	0	0	0	16	24	28
	9	13	27	32	47	69

common use in discussions of scientific thinking. The figures in the table above would seem to indicate that no pupil had generalized before the instruction to recognize the truth that we get our food from plants; but the brief instruction had imparted skill in generalization, much more to the pupils of grades I-III than to those of IV-VI.

"When the teacher of science encounters an aim stated thus: "Green plants convert the energy of light into the energy of food and fuel," there is definitive suggestion as to what the teaching is to be about . . . such is not the case with such statements of aims as "spirituality," "moral uprighteousness," and the like. But suppose the aim is stated as "The important generalizations of science": would that not be as indefinite as "spirituality"? The comparison the author makes is unwarranted, the data which he presents have no bearing on the question. One begins to suspect that the philosophy of science teaching was firmly held before the thesis was undertaken and that the data will be used to support it.

The differences in learning of the children at lower and higher grade levels "are due to the complexity of association of concepts and the complexity of the experiences involved in the concepts associated." On the basis of this he would determine the grade placement of the materials in the course of study. He classifies four of the units taught to the children as simple, three as complex. Two of the complex and one of the simple were not learned by any of the six grades. One of the complex was learned by grades IV, V and VI but not by I, II and III. While three of the simple were not learned by grades V and VI though learned by the lower grades. He spends considerable space in trying to explain (p. 91-94) why his data do not agree with his statement quoted above from the summary.

The test data presented are very valuable and a large volume of such is needed. But his "summary and recommendations" includes statements that are personal opinions unrelated to and unsupported by his data or statements that are contradicted by his data. The bibliography seems incomplete. Eight out of twenty-one of the statements of his "summary and recommendations" deal with the "objective type of aim," his example of which is the principle of photosynthesis. Yet I find nothing in the bibliography on organizing the course of study in terms of the important principles of science unless it be the Thirty-First Yearbook, Part I of the National Society for the Study of Education, which he apparently does not know emanated from a Committee rather than S. R. Powers, personally.

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BOND, ELIAS A. *The Professional Treatment of the Subject Matter of Arithmetic for Teacher Training Institutions, Grades One to Six.* Contributions to Education, No. 525 (New York: Bureau of Publications, Teachers College, Columbia University, 1934), 315 pp.

A Teacher Training Course in Arithmetic.—An examination of catalogs of teacher training institutions reveals a remarkable lack of uniformity in the program of training for prospective teachers of arithmetic. A detailed examination of the content of courses for teachers reveals even more variation in the type of material which is assumed to be necessary for preparing a teacher. In a recent publication Dr. Elias A. Bond has attempted

to formulate a more satisfactory program for teachers of arithmetic and has drawn copiously upon the literature of the subject as far as it furnishes the background for such a program of training.

Dr. Bond points out that there are three points of view which are commonly encountered as far as they relate to the training of teachers. The first of these holds that the principal requirement in the training of a teacher of arithmetic is advanced academic scholarship in the field of mathematics. A second group emphasizes chiefly the necessity of a professional outlook and a broad teacher's philosophy with the idea that if one is so equipped he may supply the necessary academic knowledge as he teaches. A third group holds that the prospective teacher should spend most of her time upon the mastery of elementary materials with some consideration of the methods of teaching them. In the face of these three points of view the author tries to formulate a program which will cover all of the necessary elements.

Following a concise discussion of the problem, Dr. Bond introduces a chapter outlining the present status of the doctrine of transfer of training as it affects the teaching of arithmetic. His statement of transfer is exceedingly brief and is not entirely satisfactory, although his conclusion from the brief discussion is sound. After this presentation of transfer the author starts on the main body of his book. In successive chapters he treats the following topics: number concepts, addition, subtraction, multiplication, division, fractions, decimals, percentage, measures, problem solving, and tests. In the treatment of the professional aspects of each of these topics the author considers in order the meaning of the topic, its history, and such aspects as social usage, mathematical principles involved, knowledge from psychological experiments, and philosophical and technological considerations. At the end of each chapter he gives a series of exercises and a bibliography. The treatment of the material in these chapters will be very helpful for prospective teachers of arithmetic or for teachers in service. The material is as comprehensive as the size of the book warrants and, in the opinion of the reviewer, is presented in an unbiased manner.

The concluding chapter in the book gives an outline for the organization of teacher training courses in arithmetic. For a four-year course the proposal involves a general survey course in mathematics, a brief course on the teacher's personal arithmetic, a heavy course on the professional treatment of arithmetic presumably following the material presented in the previous chapters of the book, and elective courses covering scientific studies in arithmetic and the supervision of arithmetic. For a three-year program the author would omit the survey course in the superivsion of arithmetic.

Although the book was prepared as a doctor's dissertation it would hardly be classified as a research contribution by those who define research as a contribution to knowledge presented in systematic form. Nevertheless, the report is an extremely useful compilation of material of practical value and the various hypotheses which the author sets forth, although not proved, are well set up as hypotheses. While the final judgment as to the value of the course of training outlined must be derived from experience, the book without this contributes a very well thought out plan as to what such a course of training should be. Instructors on courses in the teaching of arithmetic will find the book a very helpful reference.

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INGRAM, CHRISTINE P. *Education of the Slow-Learning Child* (New York: World Book Company, 1935), pp. XII + 419.

In this study of the "Education of the Slow-Learning Child," the author emphasizes the idea that he is a growing individual, that his education must be taught through the sphere of concrete experiences, and that there can be no definite demarcation of groups on the basis of intelligence alone. The book is divided into three parts with an excellent introduction written by Elise H. Martens, Senior Specialist in the Education of Exceptional Children, United States Office of Education. At the end of each chapter are very helpful questions and suggestions for study accompanied by a most comprehensive list of references.

In Part I, the nature and needs of mentally retarded children with IQ's ranging from 50 to 75 are discussed at length, stressing especially the various ways in which they are most like the normal individual. A very important point is made, in that there is a place for the largest percentage of them in industry and in the community,—the writer using for her proof the three studies compiled by Anderson and Fearing, the Children's Bureau of the United States Department of Labor, and the Massachusetts State Legislature. She feels that this group should be educated for the proper use of their free time,—a factor that all teachers and members of society who come in contact with these individuals should endeavor to promulgate.

The author gives as the outstanding objective to be sought for in the education of the slow child: "mental and physical health; a practical working knowledge of the tool subjects; worthy home and community life; and worthy use of leisure."

In Part 2 a program for the mentally retarded is described in detail, using as an example for the typical special class organization the system employed in Rochester, New York where the author is supervisor of Special Education. The special class is defined as an educational laboratory stressing the importance of the child's physical condition and the development of his social habits and attitudes in relation to his mental growth.

In Chapter 9, she outlines the general attainments at the various age levels and gives a detailed description of the unit method as a means of reaching these goals with a list of books that may be helpful for each unit and 79 references on the unit plan itself. This should be of great assistance to the teacher and student working in this field. A very excellent discussion in relation to the acquirement of the tool subjects, emphasizing the fact that they should be practical, is disclosed in this study with an accompanying series of books which have been found to be suitable in content for the mentally retarded and dull-normal. Carefully planned, simple instructions are included which aid in the teaching of the tool subjects to the slow-learning child.

The author, likewise, believes in vocational guidance and follow-up for this group giving a plan for a supervisory service designed to facilitate the adjustments of these pupils in industry.

In Part 3, the children with IQ's ranging from 70 or 75 to 89 are discussed, placing considerable emphasis upon the fact that a plan for their education should be developed in all of the school systems, and that there is a need for recognizing their particular aptitudes. At the conclusion of her treatise, a carefully formulated list of specific suggestions is given for the teacher who has a retarded class or a group of slow-learning individuals within a normal group.

This book is outstanding in its class and should be a part of the library of all teachers and students who have contact with the slow-learning child.

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JERSILD, ARTHUR T., AND HOLMES, FRANCES B. ***Children's Fears.*** Child Development Monographs, Monograph No. 20 (New York: Bureau of Publications, Teachers College, Columbia University, 1935), pp. XVI + 336.

In this exceedingly detailed study of children's fears, a number of different approaches have been employed. First, parents were asked to keep daily observational records of all indications of fear shown by their children during a period of 21 days. Prepared forms were used for making records, of which 153 completed sets, representing 130 children from 119 families were secured. For 15 of the subjects, a second set of records was secured after an interval of several months; for one child, three sets were obtained. The ages of the children varied from 3 to 97 months. As a supplement to this material, adults who had frequent contacts with children were asked to describe actual instances of fear observed in children under the age of four. In this way, accounts of 190 fears representing 129 children were supplied by 52 different individuals. A third method employed was that of the recall questionnaire. A total of 303 adults, mostly college students, were asked to fill out a questionnaire calling for data regarding fears remembered from their own childhood. For comparison, the reports of an earlier study by Jersild et al. in which 398 children between the ages of 5 and 12 years were questioned about their fears are reanalyzed according to the categories employed in the present study. Finally, a series of experimental situations thought to be conducive to fear was devised and tried out with 105 children between the ages of 24 and 71 months.

Each set of results has been subjected to a searching analysis and the findings presented in minute detail. Many of the tables are several pages in length. The authors stress the unpredictability of fear behavior as manifested by the facts that the same objective situation will arouse intense signs of fear in some children while others remain unaffected by it, and that "conditioned" fear behavior sometimes arises from apparently insignificant episodes while in other instances even very intense frights fail to exert any lasting effect upon observable behavior. The evidence for and against the Watsonian theory of fear is discussed. It is concluded that there is no single and innate basis for fear, as Watson claimed, but there is a maturational sequence in respect to the situations most likely to induce the behavior as fear. Generally speaking, young children are more likely to be affected by contemporary and concrete events such as loud noises or unexpected and sudden movements, while as the individual grows older, there is an increasing tendency to fears of an imaginative and anticipatory character. The Watsonian theory is too simple to serve as an adequate explanation for the origin of all fears, though it undoubtedly throws light on certain aspects of the picture.

Sources of error in the various techniques employed in this and other studies are considered in the light of the discrepancies in the results obtained. It is pointed out that the high percentages of instances in which a loud noise was reported as the cause of fear in the uncontrolled situations may be in large measure a function of the frequency of loud noises in the typical environment, while the fact that other conditions are less frequently reported as sources of fear

may mean only that children rarely experience them. In the experimental situation in which each of eight stimuli were presented with approximately equal frequency, the loud noise (striking an iron pipe with a hammer by a concealed assistant) was one of the least effective of the stimuli used, while in the reports by parents based upon everyday observations, noise led all other situations in the frequency of arousing fear. Fears recalled by adults also show little agreement in character with those reported for children by adult observers.

The chief contribution of this monograph is that of calling attention to the many methodological problems involved in a study of this kind, and the dangers of drawing too hasty conclusions from any single type of evidence. The behavior known as fear is a phenomenon that is bound up with questions of maturational level, individual differences of many kinds, environment and training, momentary states of tension or relaxation, summation or conflict of stimuli and many other variable factors, all of which must be taken into account in attempting to explain or predict its occurrence.

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MARKEY, FRANCES W. *Imaginative Behavior of Preschool Children.* Child Development Monographs, Mongraph No. 18 (New York: Bureau of Publications, Teachers College, Columbia University 1935), pp. XVI + 139.

Imaginative behavior, defined as "instances in which a child, through its language or overt behavior, dealt with objects, materials, activities and situations as though they had properties or attributes other than those which they apparently or actually seemed to possess" was studied in three groups of nursery school children. The techniques employed consisted of directed observation during the free-play period and during two specially devised experimental situations (building with blocks and play with a set of toy furniture.)

The results show the expected increase in frequency of imaginary play with advancing chronological and mental age. Sex differences were small and inconsistent. Correlations between imaginative behavior of the same children when observed in different situations were in most instances low; a fact that is in general agreement with other recent findings as to the specificity of most so-called personality "traits."

The study bears evidence of careful planning and meticulous attention to methodological details. That the results seem meagre in proportion to the amount of time spent upon it cannot be ascribed to faulty use of the technique selected but rather to limitations inherent in the technique itself. In following the various investigations in which the "time-sampling" method has been employed, I have become increasingly impressed by its extremely small yield of significant data per unit of time expended, and by the hazards of drawing general conclusions from data in which the conditions giving rise to the behavior studied are not only uncontrolled but are in most instances unrecorded.

To me, the most valuable part of the study is to be found in the large number of illustrative incidents that are scattered throughout the monograph. While this material does not readily lend itself to quantitative treatment, it holds much interest for the student of child development. Here it is shown what a narrow boundry separates the world of reality from the world of phantasy in the mind of the young child. One could wish that the author had seen fit to abandon the path marked out by the mental testers and attempted instead to consider the evidence in terms of the development of

symbolic thought and the understanding of reality.

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SMITH, MAX. *The Relationship between Item Validity and Test Validity.* Contributions to Education, No. 621 (New York: Bureau of Publications, Teachers College, Columbia University, 1934), pp. VII + 40.

The aim of this study was to discover (1) whether a test made up of items with high bi-serial r values would be significantly better than a test made up of items with low bi-serial r values in its tendency to yield scores correlating highly with criterion scores; (2) whether the validity of the shorter test obtained by eliminating items with low bi-serial r values was greater than the validity of the longer original test.

The testing material used in this study consisted of 200 multiple-response English vocabulary items. These were administered in 1930 to 370 bright eighth and ninth year pupils, and for each item the bi-serial coefficient of correlation with total scores was computed. The items were then ranked in descending order of these coefficients and four 20-item sub-tests and a 120-item criterion test were formed. The "best" sub-test consisted of the 20 items ranking 1-20, with bi-serial r's ranging from .71 to .91; the "high" sub-test of items 61-80 with bi-serial r's from .54 to .58; the "low" sub-test of items 121-140, with bi-serial r's from .42 to .45; the "worst" sub-test of items 181-200, with bi-serial r's from—.18 to .27. The remaining 120 items constituted the criterion for evaluating the validities of the four sub-tests.

In 1931 the items were again administered, in rearranged order, to an equivalent group of 542 pupils. In 1932 they were given in the original order to a similar population of 527 pupils. In both instances the items which constituted the four sub-tests and the criterion test were respectively identical with those which constituted these tests in 1930.

Pearson product-movement r's between scores on the respective sub-tests and scores on the criterion test were accepted as measures of the validities of these sub-tests. The weighted averages of these coefficients for the three years were, for the four sub-tests, .8717, .8782, .8276, and .4478 respectively. Thus, the "high" sub-test was more valid than the "best" sub-test, although the difference was not significant, the "low" sub-test was significantly less valid than either of these, and the "worst" sub-test was very much the least valid of the lot. As far as this experiment can demonstrate, there seems to be no very clear tendency for items with marked bi-serial r validities to contribute a more valid test than items of moderately high or average validities.

With regard to the second phase of the experiment—the effect on the validity of a test of shortening it by discarding poor items—the same 120-item criterion was used and the 80 poor items of the four sub-tests constituted the complete test to be studied. These 80 items yielded a weighted validity coefficient of .9321. When the 20 items of the "worst" sub-test were eliminated, the remaining 60 items yielded a coefficient of .9387, and with the items of the "low" sub-test likewise eliminated the coefficient for the 40-item test became .9127. Thus the test gained in validity by the elimination of the "worst" items but lost by the added elimination of the "low" ones. Although the differences were significant both were so small as to lead us to question the value of the indiscriminate validation of test items. Of course if a test is to be standardized for very wide use, with working time an important consideration, we may be justified in expanding a good deal of work to effect a small improvement.

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RESEARCH NEWS and COMMUNICATIONS

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SELECTED BIBLIOGRAPHY ON THE METHODOLOGY OF EDUCATIONAL RESEARCH AND RELATED PROBLEMS, 1935-36

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This is the seventh annual bibliography on the methodology or techniques of educational research to be published in the *Journal of Educational Research*. It covers the period from approximately July 1, 1935, to July 1, 1936. The earlier annual bibliographies may be found in the issues for October, 1930; September 1931; October, 1932; September, 1933; September, 1934; and October, 1935.*

Under the first heading of the bibliography, the reports of Briggs' committee dealing with *Issues in Secondary Education* and of Sears' committee on the *Place of Research in Educational Reconstruction* are of considerable interest. As in other years, a large number of references represent historical resumés of accomplishment, current developments, present status, trends, and predictions of future developments covering a wide variety of areas, issues, and problems, including state school administration, business administration, buildings and equipment, comparative education, teacher education, professional education, adult education, parent education, junior college, secondary schools, guidance, adolescence, curriculum, home economics, industrial arts, music, mathematics, instructional procedure, study problems of pupils, elementary education, educational sociology, child psychology, physical growth, measurement, social psychology, child labor, and rural education.

Under the second heading, Alexander's *How to Locate Educational Information and Data* is an outstanding contribution of the past year. As in other years, the bibliographical and summarizing aids listed include frequent reference to materials published in the *Review of Educational Research, Psychological Bulletin, School Review, Elementary School Journal*, bulletins of the U. S. Office of Education, and abstract volumes of graduate theses.

Under the third subdivision dealing with methods for collecting, analyzing, interpreting, and reporting data, the year has brought forth an unusually large number of books: research methodology in general (Good, Barr, and Scates, Seyfriend), testing (Buehler, Greene and Jorgensen, Kelley and Krey, Lee, Newkirk and Greene, Symonds and Jackson), statistics (Cooke, Odell, Sorenson), examinations (Hartog and Rhodes, Hawkes), observation (Wagoner), and diagnosis (Baker and Traphagen).

Under the fourth heading, concerned with evaluation, the yearbook on ability grouping, prepared for the National Society for the Study of Education by

* Extensive additional bibliographies may be found in Carter V. Good, A. S. Barr, and Douglas E. Scates, *The Methodology of Educational Research* (New York: D. Appleton-Century Co., 1936), pp. xxi + 882.

Coxe's committee, has attracted widespread attention.

Those interested in the training and guidance of research workers and graduate students, as represented in the references under the last major subdivision, will find Reed's investigations of the effective and ineffective college teacher quite pertinent.

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third, the facts of the class attainment in certain topics of the same subject which show that success depends upon the close adjustment of topic presentation to the pupil's growing mental power.

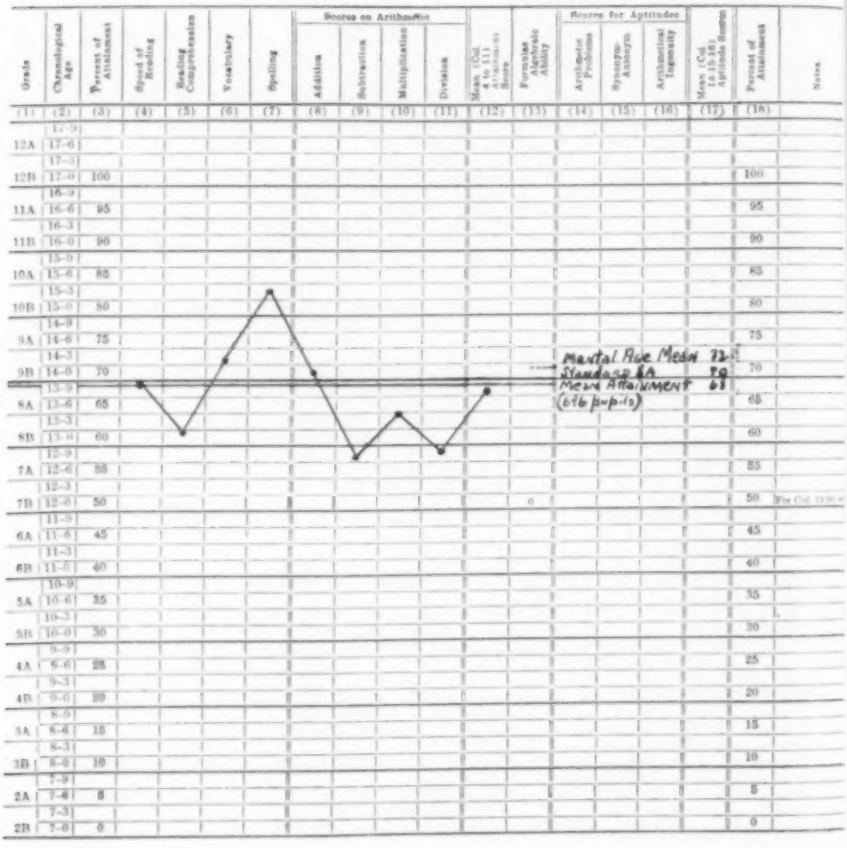
Turning to the next two pages, on the *percent chart for correlation ratios*, each of the scores for success in the study subjects has a ratio to the standard for the school grade. To interpret the fuller situation for the individual pupil and for the class success, a definite ratio of the scores of each pupil with his own mental age line furnishes an essential measure of the relations of teacher instruction and of the adjustment of textbook presentation to success, as well as a measure of the pupil's zeal. The *ratio quotient table* gives, on one line for each pupil of a class, the relations between attainment and the grade standard which are pictured for each on the graph sheets on the last page of the battery of the scales.

PERCENT CHART FOR CORRELATION RATIOS

The percent scores to be plotted on the chart are taken from the record of scores given in the table on the upper right hand corner of page one of the attainment scales.

The graph drawn below shows the median attainments of 696 pupils at the end of grade 8A, in eight subjects. The mean score of 70 is standard for this grade. The mean scores on each subject of the 696 pupils are as follows for each of the columns:

(4) 70; (5) 62; (6) 73; (7) 84; (8) 71; (9) 58; (10) 65; (11) 59. The mean is 68. The mental age mean is 72.



Directions for Using the PERCENT CHART FOR CORRELATION RATIOS are found on page 12 of the pupil's test booklet. The use of this chart is important since it shows the correlation ratios of each score with the standard for the class. Its use is recommended to give a visual picture of each child's attainment.

RATIO QUOTIENT OF PUPILS' SCORES TO STANDARD FOR CHRONOLOGICAL AGE 14-0 (70)

Grade 8 A

	(1)* Attain. M. A. Ratio	(2) M. A. Stand. Ratio	(3) Speed of Read.	(4) Read. Comp.	(5) Vocab-ulary	(6) Spell.	(7) Add.	(8) Subt.	(9) Mult.	(10) Div.	(11) Mean Attain.
1.	0.90	1.29	1.43	1.07	1.20	1.11	1.19	1.07	1.07	1.07	1.16
2.	0.94	1.29	1.43	1.43	1.29	1.36	1.13	0.66	1.31	1.07	1.21
3.	0.85	1.14	1.37	0.76	1.11	1.07	1.01	0.60	1.13	0.71	0.97
5.	0.74	1.14	0.87	0.54	0.89	0.71	0.96	0.77	0.90	1.07	0.84
6.	1.11	1.14	1.43	1.30	1.31	1.40	1.19	1.13	1.31	1.07	1.27
7.	1.04	1.14	1.43	1.30	1.34	1.27	1.13	0.83	1.13	1.07	1.19
8.	0.90	1.14	1.43	0.90	0.94	1.06	1.19	0.66	1.13	0.90	1.03
9.	0.97	1.00	1.29	0.67	0.94	0.99	1.07	0.90	0.96	0.71	0.97
10.	0.86	1.00	1.29	0.54	1.17	0.43	1.01	0.96	0.90	0.60	0.86
11.	0.91	1.00	1.29	0.54	1.06	1.23	1.19	0.77	1.13	1.19	0.91
12.	0.99	1.00	1.29	0.76	1.14	1.17	1.01	0.60	0.96	0.96	0.99
13.	0.95	0.86	1.29	0.71	1.09	0.91	0.77	0.54	0.71	0.47	0.81
14.	1.02	0.86	1.29	0.59	0.91	0.91	1.07	0.54	0.90	0.71	0.87
15.	1.12	0.86	1.29	0.99	1.11	1.03	1.01	0.83	0.71	0.71	0.96
16.	1.15	0.86	1.29	0.54	0.89	0.99	1.01	1.07	0.96	1.13	0.99
17.	1.24	0.71	1.37	0.63	1.03	0.96	0.90	0.71	0.77	0.71	0.89
18.	1.36	0.71	1.43	0.99	1.20	0.96	0.96	0.71	0.77	0.71	0.97
19.	1.22	0.71	1.29	0.71	0.83	0.76	1.01	0.83	0.83	0.66	0.87
20.	1.28	0.71	1.29	0.59	1.11	1.11	0.66	0.83	0.90	0.83	0.91
21.	1.36	0.71	1.37	1.30	1.34	1.34	0.96	0.41	0.66	0.41	0.97
22.	1.32	0.71	1.29	0.63	1.11	0.94	1.19	0.66	0.83	0.90	0.94
23.	1.06	0.71	0.87	0.49	0.91	0.74	1.07	0.41	0.90	0.66	0.76
24.	1.18	0.71	1.29	0.59	1.06	1.01	1.01	0.54	0.71	0.54	0.84
25.	1.43	0.57	1.29	0.54	0.91	0.90	0.77	0.47	0.90	0.71	0.81
26.	1.65	0.57	1.29	0.71	1.09	1.33	1.01	0.60	1.07	0.47	0.94
27.	1.25	0.57	0.87	0.54	0.91	0.69	0.71	0.71	0.77	0.47	0.71
28.	1.65	0.57	0.87	0.54	1.06	1.31	1.07	0.83	0.90	0.90	0.94

*In column (1) the ratio quotients are given of the mean attainment score divided by the mental age score. This shows, with column (2), the relation between the efficiency quotient and the quotient showing school effect on attainment.

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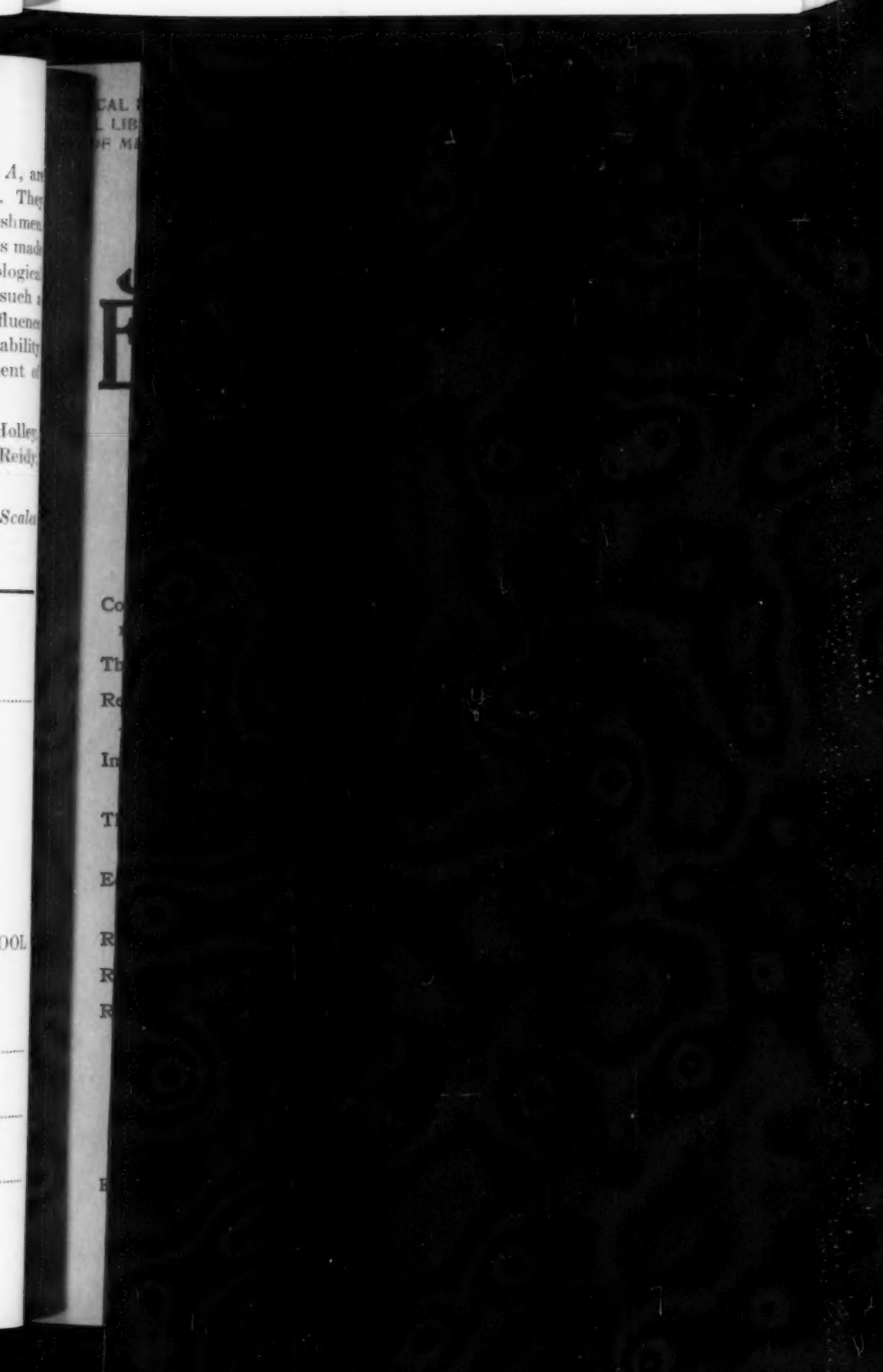
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